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## EFFICIENCY OF THE EYE UNDER DIFFERENT SYSTEMS OF LIGHTING.

Among the papers presented at Buffalo last week at the joint sessions of the Illuminating Engineering Society and the International Congress on School Hygiene, none will be of more interest to the illuminating engineer than the account by Prof. C. E. Ferree of the results of his tests for the efficiency of the eye under different systems of illumination.

Dr. Ferree is a member of a committee of the American Medical Association which was appointed in 1911 to make a study of the effect of different lighting systems upon the eye and the carrying out of the laboratory work of this committee has devolved upon him. The first necessity in this work was a criterion for the condition of the eye, and a satisfactory criterion was finally found and was described in a paper at last year's convention of the Illuminating Engineering Society. It was found that visual acuity, as a measurement of fatigue or loss of discerning ability of the eye, was not a satisfactory criterion, since the eye will recover its initial power for a short time under the stimulus of a special effort to see; but if the element of time be introduced it was found that after a period of work the eye does not function as well as it does initially. The test finally adopted was to observe the test object for a period of three minutes and to record the length of time during which it was clearly seen, and the length of time during which it appeared blurred. The criterion is, therefore, the ability for sustained vision.

Tests of this nature have been carried out by Dr. Ferree under daylight and under three particular installations of artificial lighting, one of which is classed as direct, one as indirect and one as semi-indirect. The first tests were simply to compare the four conditions of lighting and the results given are for a single intensity of illumination which was made the same for each case; namely, two foot-candles. It has been found that at the end of a period of three hours, during which the eye has been used for reading under the specified lighting arrangements, that the ability for sustained vision or what is called by the author the efficiency of the eye is little impaired in the case of daylight and of indirect illumination; whereas there is a considerable falling off for the other two artificial installations.

In a second set of observations the intensity of illumination was varied under each of these systems. Here, again, the results were most favorable for daylight and almost as favorable with the indirect installation. With

the installation which is designated as semi-indirect it was found that the efficiency of the eye is well sustained only for a very small range of intensities; for either higher or lower illumination the decrease in efficiency at the end of the three-hour period is very marked. For the installations of direct lighting used, the efficiency was found to be low for all intensities, although here again a maximum was found for a particular value of the intensity. The particular values of the intensity which were found to give the best results in ability for sustained vision are much below the values for which visual acuity is greatest, and are lower than are generally regarded as desirable for any close work. For the installations used by the author it is, therefore, to be concluded that the intensities necessary for close work would not be conducive to sustained vision.

The results already obtained by Dr. Ferree are of great importance and those interested in illumination will await with eagerness the extension of the test conditions to a large number of installations and to a large number of observers. The same or a similar criterion should be used by others having the necessary laboratory facilities, in carrying out experiments along similar and yet varied lines, since a very large amount of time will be necessary for a single observer to cover the wide field which is immediately opened up, and to multiply observations to an extent that will leave no room for doubt as to the reliability and universality of the results obtained. While the ability to maintain the visual efficiency of the eye is not the only thing to be considered in planning either artificial or daylight illumination, it is certainly an important one, and a system of illumination which fails on this test must greatly excel in some other feature to warrant its adoption. It must be borne in mind, however, that Dr. Ferree's results were obtained in a single room of invariable dimensions and with a single (or in one case, two) installation of the given type. Whether these installations are indeed typical of the class in which they are placed may be open to question until a more detailed description of the installation is provided. Indeed, what is to be regarded as a typical installation of semi-indirect illumination may be a matter upon which few illuminating engineers would agree.

## A LANTERN NEED.

The number of instances in which lantern slides used in connection with lectures and addresses of various kinds are projected upon the screen in a wrong position is provokingly large. Who has not been one of an audience that has watched a discomfited operator place the slide in three or four different positions before finding the correct one? Frequently when the first attempt brings the slide in the wrong position and a rotation of 180 degrees is necessary, the rotation is made about the wrong axis. With skilled operators this of course seldom happens, but skilled operators seem to be seldom in evidence, except at the performances of professional lecturers.

In other instances where hand-feed lanterns are used, there seems to be great difficulty in maintaining the electric arc in the proper position or even in maintaining it at all.

The remedy for these conditions should be simple and it is certainly urgently needed. One solution would manifestly consist in the use of a lantern with automatic feed and equipped with an electric motor or other electrically actuated device for changing the lantern slides. A stock of the latter could be placed in proper position in a feeding mechanism beforehand, and it should only be necessary for the lecturer to press a button to have one slide removed from the stage of the lantern and the next one inserted in its place. The mechanism for doing this need not be very complex and the expense need not be great in comparison with that of the lantern itself. There is much room for improvement in the facilities now commonly in use. Automatic operation is a crying need.

## RESISTANCE AT LOW TEMPERATURES.

It was discovered years ago that the resistance of certain metals varied with the temperature according to a linear law in such a manner that if this law held for an indefinite lowering of the temperature the resistance would become zero when the temperature reached the absolute zero. It was not generally supposed, however, that such a linear law would hold through this entire range of temperature; and as the range of temperatures over which the measurements could be made was increased, it was usually found that the linear law had to be modified; the idea that even a pure metal would ever have zero resistance was consequently abandoned.

The achievement of liquefying helium gas made it possible to obtain temperatures lower than any formerly available, and during the last few years experiments upon the resistance of metals at these low temperatures have been carried on by Prof. H. Kamerlingh Onnes at the Leiden laboratory, in Holland. Several reports were published in 1911 (see issues of June 24, July 1 and October 7) indicating as a result of these experiments that the resistance of certain metals reached, at temperatures near the absolute zero, values so low that they could not be detected by the instruments and methods available, and it was suggested that the old idea of zero resistance might correspond with the facts.

The experiments indicated that gold, platinum and mercury possessed this property. For instance, when the resistance of mercury was reduced below 4.19 degrees absolute (Kelvin scale) the resistance had a value not greater than one ten-millionth of the value at ordinary temperature. Recent experiments show that the same phenomena are observed for lead and tin.

A curious phenomenon observed by Professor Onnes is the existence of a critical value of the current below which the resistance is not appreciable,

but above which it increases very rapidly with increase of current. This critical value of the current is determined by the temperature and only exists below that value of the temperature for which the resistance suddenly disappears. The only explanation offered for this phenomenon is that a local generation of heat is caused by some minute resistance such as may occur at a contact surface, and that the local rise of temperature thereby produced increases the resistance and produces further heating, so that the temperature of the conductor is not the same as the observed temperature of the bath surrounding it.

## MUNICIPAL STREET LIGHTING IN CHICAGO.

Street lighting in a large and growing city is a complex problem. The requirements to be met with are many, particularly in some of our large American cities which have been hampered by restrictions of their taxing and bonding powers. These limitations have sometimes resulted in the provision of the minimum possible lighting that the citizens would put up with. The rapid change in character of many urban districts has also changed the requirements for their adequate street illumination. A still further difficulty has been the political control of municipal functions.

It is pleasing to be able to note a street-lighting system in one of our largest cities which is being remodeled and extended in a manner not only to overcome the difficulties mentioned above, but also to produce an ultimate equipment which in the completeness and high economy of its electrical street lighting will be second to none. Thus must be regarded the new street-lighting system of Chicago, which is described on other pages of this issue. In the rehabilitation of this system many noteworthy features have been developed which are bound to set a standard in street lighting, particularly of large communities, although no doubt influencing the illumination of cities of even moderate size.

One of these new developments is the perfection and first installation on a large scale of the long-burning carbon flame-arc lamp, of which it is planned to use something over thirty thousand throughout the city when the extension and remodeling of the system is ultimately completed, as now projected. These lamps have proven very satisfactory in service and are now doubtless the most powerful and most efficient type of unit available for street lighting. Some fear was felt on the part of many familiar with street-lighting methods and equipment that these lamps were of too powerful a character to be used as a standard type of equipment throughout an entire city. Actual installation of the lamps, however, has shown them very well adapted for the lighting of nearly all streets, with the exception of those where dense and low-hanging trees prevail. The high suspension adopted for these lamps, 25 and 22 feet, respectively, has given good light distribution and also removed them largely from the ordinary line of vision.

The series tungsten lamps used in those residence districts where dense foliage is met with have also given good satisfaction. These are fed from steel-armored underground cables, which are being used on a comprehensive scale for the first time in a large city. Through the adoption of this type of underground construction and also by the adaptation of old gas-lamp posts, marked economy in the installation of the tungsten system has been achieved. The recent development of a tungsten lamp of very high efficiency may improve the status of this type as regards cost, and lead to its more extensive use.

While the use of overhead circuits in any part of a large city is open to criticism, it has been shown in the Chicago installation to be not only a good practice under the conditions, but one giving a neat and substantial construction. The low cost of this type of construction has been a valuable feature in permitting the extension of the electric lighting system to many parts of the city where frequent and urgent demands for electric lighting have been made on the part of the citizens in general. The prevalence of crime has been an important factor in creating this demand, and was one of the reasons for adopting the most powerful type of lamp available. Where the lighting has been remodeled to the new standards, its value as a decided aid to the police and as a deterrent to criminals has been conclusively proven.

An unfortunate difficulty has arisen in the proposed plans for extending the Chicago electric lighting system to all parts of the city. This has been the possibility that the Sanitary District of Chicago, which is a sister public body occupying substantially the same area as the city and which has been supplying the electrical energy from its water-power plant for municipal purposes, may not be able to supply all of the power needed for the proposed extensions. The city electrician has ascertained that the chief central-station company in Chicago is able to supply this additional energy at a figure substantially equivalent to that at which the Sanitary District is willing to supply part of the added load, and has recommended such a solution of the difficulty. For this recommendation the city electrician has been criticised by some politicians and newspaper editors, who advocate the establishment of steam-driven lighting stations to supply the extra load, despite the fact that the city but a few years ago dismantled its steam plants. The re-establishment of such plants, operating only during the night, is doubtless unwarranted on account of the high initial expense and heavy fixed charges this would entail. There has been shown too large a tendency in those cities where municipal plants have been maintained, to look upon the central-station company as an organization inimical to the public interest. That this feeling is entirely groundless and that co-operation between all of the electrical interests, both private and public, can be made mutually advantageous to each is, of course, true, and it is fortunate that this is being recognized by at least some of the authorities concerned.

## THE CAMPAIGN OF THE SOCIETY FOR ELECTRICAL DEVELOPMENT.

By J. M. Wakeman.

The campaign for membership now being conducted by the Society for Electrical Development has raised widespread interest among the electrical fraternity. Responses have been extremely numerous, and the number of applications for membership now being received daily is very gratifying, indicating as they do both the ability to grasp the situation and the willingness to co-operate existing among the men engaged in this industry.

Quite a number of responses however indicate a desire to wait and see—to sit back and let the others declare themselves first. This means that some men are willing to trail along and join the Society at the last moment, rather than be among those who will be credited with being pioneers in the greatest co-operative movement of this time—a movement which grips the imagination and appeals to every progressive man in the industry.

This attitude will not prevent the Society from becoming a practical reality, both because its work is recognized as a real necessity in the electrical field, and because the leading electrical concerns are members of it and will inevitably put it into action. Hanging back by the faint-hearted only delays the commencement of the active work of the Society: it simply postpones the time when the electrical industry will get the benefit of the immense amount of time and thought already devoted to the work of the Society.

Some men have said that the electrical industry develops itself automatically, yet the facts remain that 80 per cent of the houses within serviceable reach of the central stations are not even wired, and not one per cent of those which are wired are equipped for complete electric service.

It is also a fact that in spite of electric current costing less today than ever, and electrical appliances being cheaper and better than ever, the popular belief persists that electric service is expensive.

The work which this Society will do is a kind which needs doing, and which no individual nor corporation can afford to do for themselves. It will directly stimulate the public demand for electric service, which means the development of the industry as a whole, which in turn means increased prosperity to every individual engaged in it.

The campaign will be nation-wide. It will remove the mistaken opinion regarding the extravagance of electricity. It will show that electricity is the only commodity of daily use which has constantly been reduced in price at a time when the cost of every other necessity in life has increased.

The way to make money is to sell people what they want. More money has been made in that way than in speculation, and always will be. Convince the people that they want electricity, and it will sell itself. That reduces selling expense to a minimum.

It will not be merely an advertising campaign. The Society has a great work to perform in harmonizing, wherever possible, conflicting local interests.

A world-worn adage has to be rewritten to read "Co-operation is the life of trade," and by so rewritting it many of our business problems will be solved. Co-operation eliminates friction, and friction always means wasted, profitless effort.

As Mr. Ell C. Bennett said, "Competiton of the old-fashioned kind means jealousy, hate, bickering, spite, financial loss—all of them cancers gnawing the pleasures and profit from business. Competition and co-operation may go hand in hand, but thus linked the latter tempers the rancor of the former, purifies it, and makes it truly an industrial tonic, instead of a galling disease without merit."

As one reads the history of the world, one is impressed by the fact that for many generations, through many centuries, man's chief occupation was war. Whether he fought clad only in the skins of wild beasts, or incased in armor, he was engaged in the keenest competition, inspired by enmity and resulting in waste.

As the world grew older, and men grew wiser, the age of business superseded the age of war, but unfortunately it continued to work on the same old principles of enmity, competition and waste.

Now, as we are growing still wiser, we are realizing that such methods do not procure the best results. We are beginning to recognize that competition must be tempered with co-operation; that the best results can only be obtained through the cultivation of good fellowship and harmony.

Business experience now-a-days makes men gravitate toward mutual interest or co-operation, which is the new and inevitable standard of efficiency and success in business.

Success is not now necessarily for the millionaire genius. It is rather for the man of human genius. The men who are competing most successfully in modern business are doing so by knowing how to co-operate with their fellow men better than their competitors do.

The future control of business will be in the hands of men who work through voluntary co-operation, men who look beyond the moment to some future day, and in the last analysis the men who permanently succeed will have to be able to see further than other people.

In the past, men have become rich by co-operating with other men to exploit the public. The man of the immediate future is going to succeed by co-operating with his competitors and with the people.

All this movement needs to set it at work at once is a full appreciation upon the part of the men in the electrical industry of the progressive spirit in which it has been conceived, and it is evident from the number of applications coming in from all directions that this spirit is rapidly becoming recognized, that the temperature of co-operaton is rising, that the industry is warming up to the many possibilities of the work of the Society.

The Society for Electrical Development is a proposition that with a small individual expense will bring big returns in increased business, better prices, and larger profits to those who participate. It is collecting funds to enable the men engaged in the electrical industry to put some of their dollars to work co-operatively to develop in a big, broad spirit the latent market. Every man engaged in the industry, owes it to himself, as well as to every other man in the industry, to put into actual operation as quickly as possible, a machine so carefully designed to work for the profit of all.

### Electrification in Italy.

The Monza-Lecco Railway, Italy, which is 42 miles long and joins the Valtellina Railway, is now being electrified for three-phase, fifteen-cycle, 3,200-volt operation. The completion of this line will give an all-electric route, 155 miles long, from Milan, Italy, to the Swiss border at Tirano, where the road will connect with the electrically operated Bernina Railway.

### New York Edison Outing.

The New York Companies Section of the National Electric Light Association is today, September 6, holding an outing at Donnelly's Grove, College Point, with track and field events. Gold, silver and bronze medals have been provided, and as all events are handicap, some close contests among those participating are expected.

### Pittsburgh Entertainment.

On August 28 the Duquesne Light Company Section of the National Electric Light Association held an entertainment at the Schenley Lawn, Pittsburgh, Pa. Music was furnished by the Pittsburgh Festival Quartet.

# Public Street Lighting in Chicago.

**This article deals with the development, rehabilitation and extension of the municipal electric street-lighting system of Chicago and describes noteworthy features of the plans for making this the most completely and economically electrically lighted large city in the world. The Chicago boulevard and park lighting system will be described in a subsequent article.**

Among the many city-betterment problems engaging the attention of the second largest city in this country is the rehabilitation and extension of its electric street-lighting system. When this work is completed within the next few years as projected, it is believed this will place Chicago in the lead among large metropolitan cities as to the amount, economy and efficiency of its street-lighting equipment. This work is being done on the most advanced engineering lines and involves many features of interest to those concerned in the proper lighting of all kinds of thoroughfares at night.

A few figures will disclose the magnitude of the problem. The area of the city is 194.45 square miles and the total length of its streets is close to 2,970 miles, besides which there are nearly 75 miles of boulevards outside of the various park areas. About 41 per cent of the streets, in the remote and therefore thinly settled districts, are as yet unpaved and bear but little traffic. The density of traffic increases as the center of the city is reached and in the downtown district the congestion approaches that characteristic of the streets of London. Not only is the street-lighting problem large and varied in character, but at nearly all times it has been necessary to contend with a scarcity of funds on account of constitutional or legislative restrictions of the taxing and bonding powers of the city, thus enforcing the strictest economy and compelling the choice of highly efficient equipment relatively free from artistic embellishment.

Fig. 1.—Michigan Avenue, South From River Street, Showing Typical Downtown Flame-Arc Lighting Supplied From Underground Circuits.

### Development of System.

The first municipal electric street lighting in Chicago was undertaken in 1887, when a small direct-current arc lighting plant was installed in the basement of a fire-engine house at Washington and Clinton Streets; this supplied 105 open arc lamps that were placed along the downtown streets and the river front. Additions to the lamps, lines and generating equipment were made each successive year, so that at the end of the tenth year, in 1897, there were three stations and a total of 1,438 arc lamps in service. In the following year the Department of Electricity was created and among the duties it took over was the control of the street-lighting system, which had hitherto been operated as a bureau of the Fire Department. From this time on extensions were made more rapidly and in another 10 years, at the end of

1908, the total number of lamps in use had risen to 9,500. Betterments were also made from time to time so that the "cash cost" per arc lamp decreased from $68.52 in 1898 to $45.86 in 1908, the "cash cost" including operation and maintenance but excluding interest, depreciation and rental; these cash costs are based on the average number of lamps in service during the respective years.

In the early stations the equipment comprised high-speed steam engines belted directly or through countershafting to groups of small direct-current series arc dynamos. Subsequently larger machines were used and compound marine-type engines were mounted directly on the main shaft, the dynamos being belt-driven from a long countershaft. Within the last 10 years alternators and alternating-current inclosed arc lamps were added to the equipment, being used principally for new extensions. The demand for more electric lights was so persistent and the available funds so limited as to prevent the retirement of all but a few of the direct-current open arcs that were rapidly becoming obsolete.

### Co-operation of City and Sanitary District.

In 1908 occurred an important change in the street-lighting system, since it marked the beginning of active co-operation between the city and the Sanitary District. The history of the Sanitary District of Chicago is well known. At the terminus of the Drainage Canal, which it had constructed from Chicago to beyond Lockport, Ill., there was built a hydroelectric plant to utilize a hydraulic head of about 38 feet. Since this plant was erected through bond issues for which the Sanitary District was sponsor and since the District includes in its boundaries practically the whole of the city of Chicago, it was but natural that the electrical energy thus made available should be placed at the disposal of the city for various municipal purposes, chiefly street lighting, at substantially cost price. As soon as the plant was put in operation arrangements were made to shut down the steam equipment in the electric light stations and to substitute therefor synchronous motors supplied with Sanitary District current. This resulted in considerable saving in operation. Although no appropriations were then available for complete overhauling of the equipment and the replacement of obsolescent machinery and lamps by modern and more efficient apparatus, it was decided to make extensions at least by more economical and up-to-date means. Consequently there was inaugurated the policy of establishing future lighting plants as simple alternating-current substations containing constant-current transformers and feeding alternating-current arc lamps without the intervention of moving machinery.

The supply of current to the Chicago street-lighting system constituted the main load of the Sanitary District hydroelectric plant. On the basis of an average of 11 hours per night, or about 4,000 hours per year, this load yielded an average annual load-factor of 45.8 per cent, which is very good for a central-station system, but none too high for a water-power project of high initial cost. The Sanitary District therefore sought and was granted the right to dispose commercially of such surplus electrical energy as was not needed for the municipal purposes of Chicago and other smaller communities that were supplied from its system. Consequently a commercial load, chiefly day load, was developed. In order to utilize the transmission lines and substations to the best advantage and to keep the investment for these purposes to a minimum, a basis of closer co-operation between the Sanitary District and the city of Chicago was sought and after considerable negotiations a contract mutually advantageous to each was concluded on October 27, 1910.

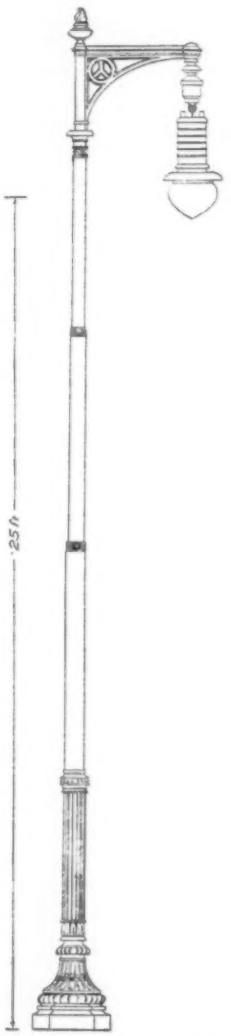


Fig. 2.—Post for Downtown District.

### The Sanitary District Contract.

By the terms of this contract the Sanitary District took over the operation of all of the city's street-lighting plants and substations, then 13 in number, for which service it was to be paid $1 per arc lamp per year. The two municipal bodies also granted to each other the use of any unused lines or conduits. The Sanitary District thus acquired the use of the substation buildings and lines for furnishing electrical energy to private customers at such times as these buildings and lines were not needed for city street-lighting purposes and it also acquired complete control of the power operating conditions; it was thus enabled to build up its load-factor at a minimum expenditure for fixed charges. Under the contract the District also undertook to supply and to install on the streets at the direction of the city electrician 10,000 additional arc lamps of 450 watts each, or their equivalent in other types of lamps, and to build and equip the necessary substations, conduits and pole lines for these additional lamps; 3,000 of these lamps, or their equivalents, were to be installed within three years. The District also agreed to rehabilitate the old direct-current open-arc system, substituting modern lamps for about 5,800 of these antiquated lamps then in use and providing appropriate substation equipment therefor. Finally the District agreed to supply the energy for both the 12,200 arc lamps then in service and for the 10,000 to be added, at a cost of $15 per horsepower per year of 4,000 hours, or $20.10 per kilowatt, which is equivalent to about one-half cent per kilowatt-hour. The duration of the contract is seven years. The advantageous features of this contract to the Sanitary District have been pointed out. To the city the contract provided a practically new street-lighting system and gave it seven years to pay for it in annual installments, a valuable feature in view of the city's stringent financial condition.

### Standard Type of Lamp Chosen.

One of the first things taken up, when plans for putting the contract into effect were considered, was the selection of standard types of lamps and posts. Tests were made on various types of the most modern lamps. Magnetite or metallic-flame arcs were found to give excellent results, but the

desire to use the simplest kind of substation equipment and to reduce substation operation to a minimum practically barred out any direct-current lamp. At this time the long-burning carbon-flame arcs were being experimentally developed in this country, and two types of these, suitable for series operation on alternating-current circuits, were given a prolonged trial after giving promising results in the preliminary tests. The final outcome was the selection early in 1912 of the General Electric type W, 10-amp., 60-cycle, series, carbon-flame arc with vertical focusing electrodes guaranteed for a life of 104 hours between trims. These lamps are of the inclosed type with an outer opal and a clear inner globe. They are adjusted to take 10 amperes and 60 volts at the arc; their power consumption is about 460 watts.

Although at the time this new type of lamp was selected it had not been in commercial service to any extent, the excellent results of the Chicago trial warranted the electrical engineers of the Sanitary District and of the city in adopting it for the standard equipment to be used in carrying out the contract. Subsequent use of these lamps in active service has borne out the confidence placed in their reliability, efficiency and generally satisfactory performance. Substantially no electrode trouble has been experienced and outages average below one-half of one per cent. The light distribution is good and the lamp in general well adapted for furnishing very economically the powerful illumination needed on practically all streets in a large city. For residence districts abounding with trees these standard lamps were found to be not so well suited and series tungsten lamps are being used in these exceptional places, as will be described below.

### Standard Types of Posts and Construction.

When the rehabilitation and extension work was undertaken there were not only a great many types of arc lamps in use but nearly as many kinds of posts and methods of mounting the lamps. A committee was therefore appointed to select a standard or a limited number of standard types of poles. After some deliberation this committee made two selections for municipal arc-light poles and also one for commercial ornamental electric lighting; these standard poles were approved by the City Council on January 27, 1913. The first two of these are shown in Figs. 2 and 3, respectively. Since the posts now being used for series tungsten lighting are remodeled gas-lamp posts, their design was not standardized because a more ornate pattern may be chosen when city funds become more abundant.

Three standard types of construction were adopted for the municipal lighting system. For the downtown or congested business district underground circuits in conduits are used with flame-arc posts such as shown in Figs. 1 and 2. For outlying districts overhead construction is used with flame-arc posts such as shown in Figs. 3 and 4. For residence districts with dense foliage underground armored cable is used for series tungsten lighting, such as shown in Fig. 6. In each type of construction the poles are of iron and every detail is carried out in a substantial and durable manner. Even the overhead construction, which it is planned to replace ultimately by underground circuits, is of rugged character and neat aspect.

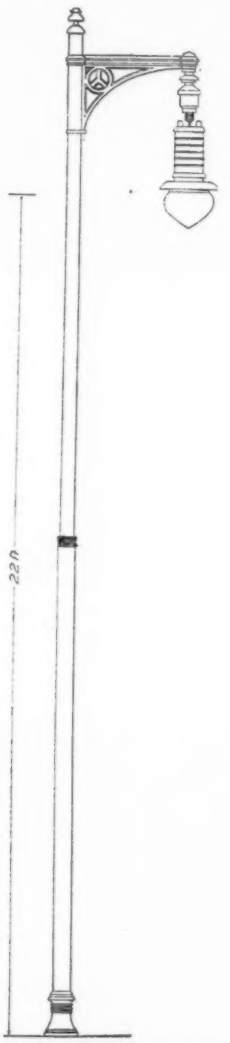


Fig. 3.—Post for Outlying District.

### Downtown Construction.

Fig. 1 is a typical view of the downtown type of construction with underground circuits. On account of the heavy automobile traffic on the street shown it was impossible to obtain a good night view relatively free from the streaks due to glaring headlights. The posts are staggered on opposite sides of the street and are sufficiently well distributed to give a very good illumination to the entire street and sidewalk surface, the light at street crossings being accentuated by having two lamps at diagonally opposite corners.

Fig. 2 gives a good idea of the downtown post. The design is neat and dignified. The mast consists of three tubular sections made of standard four, five and six-inch steel pipe, thus giving a tapering effect. The base is of ornamental cast iron and of attractive pattern. The bracket is of malleable iron, neat in outline and includes the characteristic Chicago emblem, the inverted Y. An ornamental collar beneath the bracket and two section collars relieve the appearance of the mast; each of these collars is a sliding fit. An ornamental top completes the pole. The height of the pole is such that the arc of the lamp is 25 feet above the curb. This height was determined after trial with several different heights at the suggestion of a committee of the Illuminating Engineering Society, it being pointed out that annoying glare would result from low suspension of such powerful lamps and that the light distribution would be much more uniform from a high suspension, both these points being borne out by the tests.

In order to make this height practical, special arrangements for trimming the lamp were needed, since climbing to this height was prohibitive and the use of tower wagons seemed a needless extra expense. The matter was solved by providing a lowering gear and positive cutout. A compact windlass is mounted in the base and connected by steel rope passing over two pulleys to the lamp. The cables feeding the lamp are guarded from coming in contact with the rope. To lower the lamp a crank is inserted in the windlass axle through a hole at one side of the base; adjoining this is also a door for giving complete access to the windlass. The lamp is brought down so that the trimmer can conveniently perform his work, which includes the regular electrode trimming, a complete cleaning and general inspection of the lamp. Each trimmer takes care of about 30 lamps a day. On Dearborn Street, as described in our issue of April 12, 1913, the lamps are specially mounted on the trolley poles and a tower wagon is used for trimming them.

### Construction in Outlying Districts.

In order to permit the extension of the arc lighting system to as much of the city as possible in response to the

general demand for electric lights, it was found that the offer of immediate lighting from overhead circuits was much preferred by the citizens to the rather remote possibility of getting an underground system. A neat form of overhead construction was therefore adopted for the extensions into outlying districts. As shown in Fig. 4 it involves the installation of intermediate poles for supporting the circuit wires and the placing of all lamps and poles on one side of the street. Fig. 5 is a night view of this construction on a neighboring street; the two wavy lines in the foreground are the traces of automobile headlights. The lighting has been found entirely satisfactory and a tremendous improvement on what formerly was supplied.

Fig. 3 shows the type of post used in this construction. The mast consits of two sections of four-inch and five-inch extra-heavy steel pipe. The bracket is similar to that used for underground construction and is surmounted by a short cross-arm for the line insulators. The base is of simple form. The poles are about 30 feet in length, the arc being 22 feet above the curb, and the bottom of the pole thoroughly imbedded in concrete. Intermediate poles are of slightly lighter steel pipe; corner and end poles are made in three sections of four, five and six-inch standard pipe.

For trimming lamps on the overhead lines a different lowering gear is used. The poles are too slim to permit inclusion of a windlass. An elongated hole is provided in the mast several feet above the ground; this has a removable door. The steel rope supporting the lamp has a counterweight at its lower end and to this is attached a short piece of chain that terminates in a hook that can be connected to an eye-bolt on the inside of the door. Removal of the latter pulls out the chain and to this the trimmer attaches an extension cord which he carries for lowering the lamp to the ground.

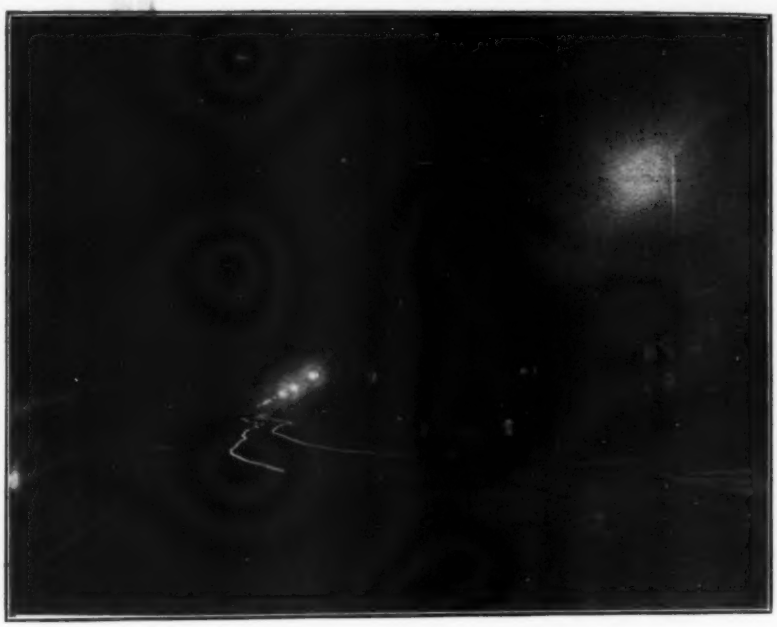

Fig. 5.—Night View of Flame Arc Lighting from Overhead Circuits.

**Rules for Location of Arc Lamps.**

In the location of all the new flaming arc lamps, which is mapped out by the city electrician's staff, the following rules are used:

Downtown Streets.—Place two lamps at each street intersection and one lamp at each alley intersection, and such other lamps as are necessary for good lighting; space between lamps not to exceed 250 feet.

Business Streets and Street-Car-Line Streets.—Place one lamp at street and alley intersections and such other lamps as are necessary for good lighting; space between lamps not to exceed 250 feet.

Residential Streets Thickly Populate.—Place one lamp at each street and alley intersection and such other lamps as are necessary for good lighting; space between lamps not to exceed 350 feet.

Residential Streets Thinly Populated.—Diagram the circuits for one lamp at every street and alley intersection and other lamps not over 350 feet apart. Place in service the lamps at the street intersections, and such other lamps as are, in the judgment of the engineer, needed.

In the foregoing a thinly populated street is considered to be one on which the houses are not to exceed one for each 125 feet of street. Where the houses are closer together than this, the district is considered to be thickly populated.

These rules, it will be observed, allow sufficient leeway to permit location of all lamps to the best advantage and thus to illuminate all parts of the street quite satisfactorily and also to provide additional illumination where dangerous traffic or other local conditions require it. The flaming arcs so far installed have been spaced on the average about 230 feet apart, making 23 to the mile.

Fig. 4.—Whipple Street, South of Twenty-second Street, Showing Flame Arcs on Overhead Circuit.

Fig. 6.—Ellis Avenue, North of Forty-seventh Street, Showing Series Tungsten Lamps on Underground Circuits.

**Underground Series Tungsten Lighting.**

The streets in many of the older residence districts, principally in what were formerly suburbs, are quite liberally provided with dense and low-hanging trees which would cut off the light from highly suspended arc lamps and prohibit the use of aerial circuits. Some complaint was also made that the powerful flame lamps would throw too much light into the sleeping apartments in the second story of residences. After a trial installation, it was found that the gas lamp posts then used for lighting these streets could be readily converted into neat electric posts, each bearing a tungsten lamp supplied from an underground circuit. This type of construction is therefore being quite extensively used where conditions require it.

Street series 100-watt clear tungsten lamps are used in 14-inch Alba glass inclosing globes. The lamps are used on four-ampere circuits and 160 are connected on one circuit. Film cutouts were not found sufficiently reliable, so shunt reactance coils with luminated cores were used instead. One of these is used at the bottom of the cast-iron head of each post and the porcelain lamp socket is mounted directly above the coil. Being in parallel with the lamp, the coil normally takes but a very small magnetizing current. If the filament breaks or burns out, the full line current passes through the coil, saturates its iron core and causes its impedance drop to increase a small amount, but the line current remains practically constant. These reactances have operated very satisfactorily, being entirely automatic and reliable and eliminating the need for constant-current regulators at the substation. The lamps also operate very satisfactorily, giving a very steady light and an excellent life above rating; the average life is from 1,500 to 1,800 hours, although many have run considerably over 2,000 hours. The mean lower hemispherical candlepower is 61.6. In the later installations 80-watt tungstens having an efficiency of one watt per candle are being used.

For the series tungsten lighting it was decided to save the expense of underground conduit and street upheaval. In place thereof there was used single-conductor, lead-covered cable protected by steel armor and an outer sheathing of tape and jute saturated with tar. The cable is laid directly in the ground without further protection except at street intersections. A strip of sod about 12 inches wide is removed just inside and parallel with the curbing. The cable is laid at the bottom of a trench about 2.5 feet deep, the earth and sod carefully replaced. Concrete cross paths are generally tunneled. The work has been done with little disturbance and all trace of it usually soon disappears. The increase in line loss due to iron loss in the steel armor has been found to be very small.

As shown in Fig. 6, the series tungsten installations are made with lamps staggered on both sides of the street. The lamps are about 75 feet apart longitudinally of the street. Two lamps are placed at street intersections. About 75 lamps are used per mile. The center of the lamp is about 10 feet from the ground, so that the light is seldom cut off by trees. The night view in Fig. 7 gives an excellent idea of the evenness of light distribution attained. The general effect is even more pleasing at night than by day; though the posts are remodeled old gas posts, their appearance by day is not exactly displeasing, the trim aspect of the globe and head making up for the lack of beauty in the stem.

**Costs of Different Systems.**

The initial and installation cost of the flame-arc system with underground circuits is about $9,000 per mile, as-

Fig. 7.—Night View of Tungsten Lighting on Ellis Avenue.

suming 23 lamps per mile, or about $391.30 per lamp; these figures include lamp, post, line and substation costs. If the same number of flame arcs is used per mile with overhead circuits, the first cost is reduced to about $4,000 per mile, or $173.91 per lamp. The first cost of the series tungsten system with underground cables and using 75 lamps per mile is about $8,000 per mile, or $106.67 per lamp.

The operating and maintenance cost, that is, the so-called "cash cost," of the flame arcs amounted last year to an average of $39.91 per lamp per year. On adding to this the fixed charges—$19.16 for interest on the investment and $13.67 for depreciation—the total annual cost of the flame arcs on underground circuits is $72.74 per lamp. For the flame arcs on aerial circuits the operating and maintenance cost is the same, but the interest and depreciation charges are lower, consequently the total annual cost per lamp is only $54.57. Operation and maintenance of the series tungsten lamps costs $13.36 per lamp per year; on adding the interest and depreciation charges, the total becomes $24.27 per lamp per year. On figuring the total costs of lighting a mile of street with the three systems, using the numbers of lamps given in the preceding paragraphs, these costs are found to be as follows: flame arcs on underground circuits, $1,673 per mile per year; flame arcs on overhead circuits, $1,255; series tungstens with underground cables, $1,820.

It is interesting to compare these costs with the annual costs of other illuminants in the city street-lighting service. At the end of the year 1912 there were in use 920 inclosed arc lamps rented from the Commonwealth Edison Company at $75.00 per lamp per year; also 67 similarly rented 100-watt tungsten lamps on overhead circuits at $25.00 per lamp. There were 11,236 mantle gas lamps (nominally 60 candlepower) whose complete cost, including gas at 80 cents per 1,000 cubic feet, was $18.93 per lamp. There were 4,504 open-flame gas lamps (nominally 24 candlepower) with a complete cost of $16.05 per lamp. There were also rented from a private company 8,678 gasoline mantle lamps (nominally 60 candlepower) whose annual rental charge was $26.64 per lamp.

**Status of Rehabilitation Work.**

As described above the rehabilitation and extension of the municipal electric lighting system is being done by the Sanitary District as contractor for the city. The latter maintains an engineering corps under the direction of the city electrician for surveying the streets, platting circuits and lamps, supervising the construction and checking the construction accounts.

Several of the old substations that were poorly located or equipped have been discontinued. Four new substations have been erected and placed in service. The number of substations now in use is 18.

The city has now in service a total of over 16,200 municipal arc lamps, or their equivalents; four and one-half series tungsten lamps are considered to be equivalent to one arc lamp. This total includes about 8,320 flame arc lamps and about 1,750 tungsten lamps. The remaining 6,000 arc lamps, or equivalents, provided for in the contract of October, 1910, will be in service by next summer. In the nearly three square miles designated as downtown district between the lake, Twelfth Street, Halsted Street and Chicago Avenue, the rehabilitation to the underground construction with flame arcs will soon be completed.

In the old direct-current arc-lighted districts many of the lamps were 400 to 600 feet apart in thinly settled parts of the city. It was obvious that to merely replace these with the new flame arc would not give the standard of illumination that the city is trying to provide. Moreover, to change over the substation equipment and lines with alternating-current apparatus without providing for the additional lamps needed for adequate lighting would entail needless confusion and duplication of circuits when the required extra lamps were ultimately added, besides unwarranted expense in relocating and again overhauling the system. Therefore the work of rehabilitation of the direct-current system has been held in abeyance in those places where it could not be done on a proper engineering basis.

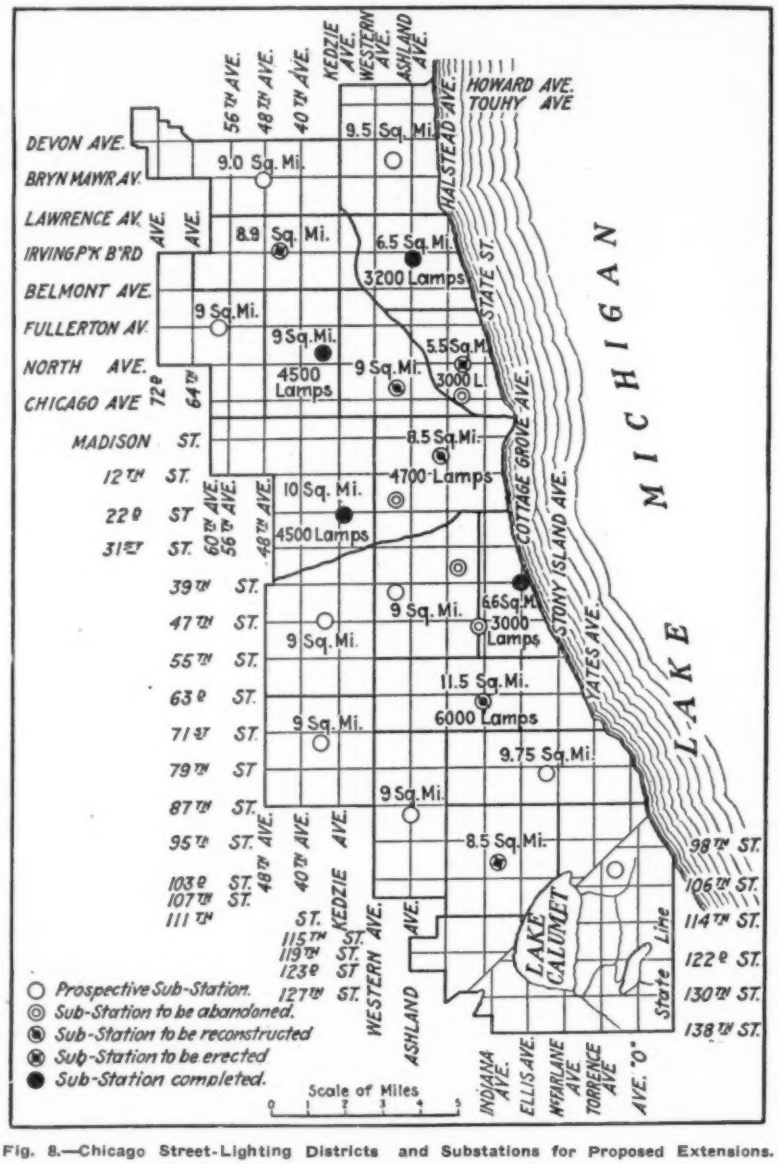


Fig. 8.—Chicago Street-Lighting Districts and Substations for Proposed Extensions.

Provisional plans have been made for ultimately doing this work.

**Plans for Further Extensions.**

In a special report made by City Electrician Palmer to Mayor Harrison he calls attention to the need of about 7,000 additional flame arcs, or their equivalents, in the districts just referred to in order to raise their illumination to the standard adopted. Outlying districts not yet electrically lighted should also be equipped with about 3,000 additional standard lamps within two or three years. There also remain in service 5,834 of the now obsolete seven-ampere inclosed alternating-current arc lamps, which should be changed to the standard flame lamps at a cost of $262,147. Although this would add about 27 per cent to their operating and maintenance cost, it would yield about 285 per cent increase in the light flux. A supplementary contract for about 1,000 additional flame arc lamps was approved, so that the total number under contract is about 23,000 arc lamps, or their equivalent. Consequently about 15,000 additional arc lamps, or equivalents, should be provided for within the next few years, making a total of 38,000 modern and most efficient lamps in the municipal electric lighting system. The city ligthing districts and substation layout for this projected system are shown in Fig. 8.

By action of the City Council the city authorities were empowered to negotiate a contract with the Sanitary District for the addition of such 15,000 flame arcs, or tungsten equivalents, on terms similar to those in the existing contract and at a total cost of from three to four million dollars. The Sanitary District trustees have informed the city authorities that they cannot accept this additional contract until the Federal Government grants their request for an increase of flow through the Drainage Canal to 10,000 cubic feet of water per second; at present the flow is restricted by the War Department to 4,167 cubic feet per second on the ground that an increase beyond this would lower the lake level and interfere with navigation; a further hearing on the Sanitary District's plea is expected in November.

With the present flow the Sanitary District can probably supply about 2,000 additional kilowatts to the city load now contracted for, thus providing for about 4,000 additional arc lamps or a total of 27,000 arc lamps, or equivalents. If this additional load is supplied, a higher rate will be demanded by the Sanitary District than that now prevailing (about one-half cent per kilowatt-hour), because the District's income from the hydroelectric system, on account of the restricted output, is not meeting all of the operating and fixed charges properly chargeable to the system. In fact, the Sanitary District is trying to have the rate under the present contract amended so as to make it a profitable one.

Should the canal flow be permanently restricted to what it now is and thereby prevent the Sanitary District from supplying more than a maximum of 13,500 kilowatts to the city lighting system, the additional 5,500 kilowatts needed for the ultimate 38,000 lamps must be otherwise procured. After careful consideration of the entire problem, Mr. Palmer, the city electrician, has recommended the execution of a contract with the Commonwealth Edison Company of Chicago for this additional current if it cannot be obtained from the Sanitary District. The Edison Company has offered such a supply at approximately 0.7 cent per kilowatt-hour, which is practically equal to the rate at which power is supplied to the electric railway companies and to the rate now offered by the Sanitary District. Mr. Palmer states that "a more reliable and economical service will be obtained should the Commonwealth Edison Company's lines ever be connected direct to the city's lighting system through the Sanitary District substation at Thirty-first Street and Wesern Avenue, as the present auxiliary steam power plants, which are now being maintained by the Sanitary District can be dispensed with. Undoubtedly a satisfactory working agreement between the Sanitary District, Commonwealth Edison Company and the city could be consummated on an advantageous basis to the taxpayers of Chicago for the supply of electric energy for the city's use if the city takes the initiative in proposing such a step." An early settlement of the terms on which the lighting system can be increased to 38,000 arc lamps is looked for.

## White Way in Los Angeles.

**Contracts have just been signed by the supervisors of Los Angeles County, California, for the installation of an ornamental lighting system along Sherman Way, the famous boulevard connecting Van Nuys with San Fernando, the boulevard being in the Van Nuys lighting district created a year ago. The Llewellyn Iron Works secured the contract for the standards, the Newbery-Bendheim Company for the installation of the wiring, and the Southern California Edison Company for furnishing electrical energy and maintaining the posts, lamps and globes.**

## Educating the Public in the Use of Light.

Within the past month, the Illuminating Engineering Society has printed for several large lighting and manufacturing companies throughout the country, an edition of more than a quarter of a million copies of its illumination primer, "Light: Its Use and Misuse." This little publication, which has been referred to several times in this journal, presents in a brief and popular form the principles of good illumination. It is being widely circulated by these companies for the purpose of creating an appreciation of and demand for more and better light. The Consolidated Gas Company of New York has issued 100,000 to its customers; the New York Edison Company, 50,000; the Edison Electric Illuminating Company of Boston, 26,000; the Philadelphia Electric Company, 10,000; and the Commonwealth Edison Company, of Chicago, 10,000. Several other companies have sent out editions of from 2,000 to 10,000 copies.

The recent edition of the primer, which contains a few minor changes from the original one, was published in a very inexpensive form so that it might be circulated widely at a small cost. For the companies which are going to issue this pamphlet to their customers during the coming lighting season, the Society is arranging to publish two new large editions, which will be available at prices that merely cover the publication costs involved. Sample copies may be obtained by interested companies upon application to the general offices of the Society, 29 West Thirty-Ninth Street, New York, N. Y.

## Electrical Displays in Louisville, Ky.

The Electric Building, formerly used by the Kentucky Electric Company, of Louisville, Ky., for exhibition purposes, reverted to that use last week during the Made-in-Louisville Exposition, the Louisville Gas & Electric Company, which now holds the lease of the structure, turning it over to local manufacturers. The principal exhibit was that of the Frank Fehr Brewing Company, which showed a "live" display, the operation of motor-driven bottling machinery being the chief feature of interest.

Other electrical displays of interest in the exposition, which was held in the windows of downtown retailers, were those of the James Clark, Jr., Electric Company, which displayed motor-driven machine tools in operation, and the Stratton & Terstegge Company, which had an electric welding outfit, used in making tinware, on exhibition.

# The Outlook.

## Conditions in the Electrical Industry as Reflected in the Opinions of Leading Manufacturers and Jobbers Throughout the Country.

While a certain amount of uncertainty with respect to banking conditions, anxiety regarding tariff legislation and the sinister influence of the Mexican crisis hang over the country like a pall, there is evident an undercurrent of hardy optimism as to the future. This is due to the fact that the prolonged tension of the past six months has not produced the evil conditions apprehended earlier in the year and the country in general is disposed to feel that our recuperative powers are ample to cope with any situation that may now arise.

Business interests have not suffered in the interval. In fact, there has been a steady maintenance of prosperous conditions, and a revival is expected in the next few months. Wholesale buyers are in the market in great numbers expecting to make advantageous purchases of goods which are to be admitted either under a reduced tariff schedule or free, when the new tariff bill is enacted into law.

Because of the unsatisfactory condition of the investment markets earlier in the year the bulk of new financing had to be delayed. Of late, however, some extensive undertakings have been announced.

So far as the electrical industry is concerned, the past six months' experience indicates considerable stability, and the outlook is not at all discouraging. In many lines of electrical material there has been a decided increase in the volume of material handled, but the expense of doing business has increased and the margin of profit has dwindled. The opportunity for the establishment of good prices and a consistent demand seems very bright and the relations of each element of the industry with the other seem on the verge of complete compatibility. The work of the Society for Electrical Development, when once properly launched, should greatly accelerate the upward movement of the industry, and there is every indication that the stimulus of the educational advertising carried on by some of the larger manufacturers is being felt in many directions.

As the direct testimony of the leading manufaturers and jobbers of the country form the most accurate guide to conditions, we are pleased to publish herewith some expressions of opinions which have been received in response to inquiries made within the last ten days.

### Allis-Chalmers Manufacturing Company.

The present condition of our electrical business is very satisfactory. No doubt the volume has been somewhat reduced by general conditions throughout the country, but the increasing applications of electricity are constantly enlarging the market for electrical apparatus.

While some of the proposed legislation is undoubtedly disturbing in character, I believe the country will soon be adjusted to it and can foresee only continued prosperity. There may be retrenchment in places, but in my opinion the outlook for fall and winter in the electrical business is very good.

OTTO H. FALK, President.

### The American Conduit Manufacturing Company.

So far as the conduit business is concerned, with the exception of the first month or two of this year, things have been rather quiet, due to two causes.

One is that the volume of new building is less than last year and, in fact, even less than a 10-year average; the other condition to which we attribute this quietness is the enormous increase in production of conduit during the last two years or so. We have today a rather serious condition of overproduction, and consequently a demoralized market condition.

Steps have recently been taken, however, with a view to putting the industry on a better footing. A new selling plan was put into effect August 1 by the National Tube Company, which entered the field at that time. The Pittsburgh Basing Discount plan was adopted and if this is followed conduit prices will be more accurately quoted than in the past. Competition in the past led to numerous cumbersome systems of freight allowances, but if the new plan is followed generally—which we believe will be the case—the result will be to bring order out of chaos. While prices are very low, jobbers have been buying only for their immediate requirements, and we feel that any general improvement in business conditions would be immediately reflected in our prices and sales.

On the whole we feel that we have had dull times for a considerable period and that the next change—although it may not come this year—should be, when it does come, one for the better.

D. H. MURPHY, President.

### Beardslee Chandelier Manufacturing Company.

Judging from the volume of our business during the past few months, the chandelier branch of the electrical industry has shown a healthy growth, and this growth has been along lines that indicate an even greater future increase in the sale of the better class of chandeliers.

The manner in which the trade has taken hold of suggestions for promoting their business along the lines of successful, modern merchandising indicates that the next year will show many great improvements in this direction, and that as much thought and salesmanship will soon be put into the retail chandelier business as are now employed in the sale of furniture, clothing and kindred lines.

Reports from our road men and customers indicate that the season has been an active one in the building line. This should mean a brisk fall and winter business for the electrical trade.

In fact, as we see it, a study of the field cannot help but put every member of the electrical industry in an optimistic frame of mind.

FRED R. FARMER, Secretary.

### Benjamin Electric Manufacturing Company.

The prospects for fall and winter business in our line are very good, and we anticipate a satisfactory increase over the corresponding period of last year.

W. D. STEELE, Vice-President.

### The F. Bissell Company.

We are optimistic as regards to business conditions for the balance of the year. Business to date with us has been good in all departments and from orders on hand for fall shipments and inquiries received, we look for no change in the immediate future.

The same thing also holds true as regards our manufacturing activities, and as these extend from the manufacture of Washington fir, yellow-pine cross-arms and locust pins for the public service companies to iron boxes for the contractor and Bissell cleaners and Bissell sewing-machine motors for the consumer, it indicates to us at least, a satisfactory condition of affairs in practically all sections of the country.

W. S. BISSELL, Secretary.

### The Adapti Manufacturing Company.

As far as Cleveland and vicinity are concerned, the outlook is very bright. While July and August are the two dullest months in our line, we have not noticed any falling off in orders for this territory. As a matter of fact, our sales for July and August have exceeded those for May and June.

J. C. BOYTON, General Manager.

### The Buckeye Electric Works.

The outlook and the conditions are exceedingly good. Money may be a little tight and collections a little slower than they were a year ago, but we are feeling no ill effects today and our business is growing much more rapidly than it did for 1912 over 1911, and business so far in 1913 is the best we have ever had in the history of the Buckeye, and considerably ahead of 1912.

L. P. SAWYER, General Manager.

### Central Electric Company.

The outlook for fall and winter business in electrical supplies is good. Conditions are favorable and we are looking forward with confidence.

GEORGE A. MCKINLOCK, President.

### Detroit Fuse and Manufacturing Company.

I feel very optimistic in regard to the

business situation. In spite of the fact that business in general shows a decided decrease compared to last year, I believe the electrical industry is not to be seriously affected. This is true, at least, so far as this company is concerned, judging from the present outlook.

B. D. HORTON, General Manager.

**D & W Fuse Company.**

We are already noting an improvement in general business conditions. We are optimistic as to the prospects for fall and winter business and feel confident that our sales will be well up to the high-water mark for the corresponding periods of previous years.

G. W. STEERE, Chief Clerk.

**Dossert & Company.**

The business of our company for the first eight months of the calendar year 1913 shows an increase of slightly in excess of 25 per cent over 1912 for the corresponding period. Our export business shows a notable increase, especially in Central and South America, the Canal Zone and the West Indies. While the activity of the electrical industry in this country may be affected by conditions of ease or stringency in the money market during the remaining months of the year, we believe the industry as a whole will move forward with increased momentum should Congress pass the tariff and banking reform measures with reasonable promptitude and adjourn, thus giving the business and financial world a chance to adjust itself to changed conditions.

H. B. LOGAN, President.

**Duncan Electric Manufacturing Company.**

The outlook for our fall and winter business is decidedly gratifying, and in anticipation of increased sales, we have increased our force and machinery about 25 per cent in the past 60 days. In the past 12 years, our business has shown a steady and healthy growth, and has reached a point where our output seems to be little affected by trade depression which arises from time to time. Our shipments for the next six months we expect to exceed all previous records.

THOS. DUNCAN, President.

**Electric Appliance Company.**

From every indication that I can see today it is going to be more of a question of securing the goods to fill orders than it is a question of getting the orders. The only stumbling block in the way of successful business today is the money market. While we have been very busy in the past, and every indication points to heavy business this fall, our collections are not at all satisfactory. I feel confident, however, that this handicap to fall business will be removed as soon as the Government distributes the fifty million dollars to assist in moving the crops. In the territory which we cover we have never had better crops than we have this year, and with this assistance from the Government in moving the same, if the manufacturers and distributors of electrical supplies will stand firm upon the policy of securing prices which will allow them to make an adequate profit for the handling of this business, the electrical industries should wind up a most successful and prosperous year.

W. W. Low, President.

**The Electric Storage Battery Company.**

The sales of The Electric Storage Battery Company last year were the largest in the history of the company, and this year's sales to date are ahead of the corresponding period of last year. While there has been some let-up in large contract business, this has been more than offset by the growth of our small business, and we are looking forward to an excellent business during the fall and winter.

CHAS. S. BLIZARD,
Third Vice-President.

**Faries Manufacturing Company.**

Our year ended on July 1, and was the second largest year, in volume, we have ever had, but our profits were not at all what they should have been. We are quite busy at the present time, and from all reports we can gather from our salesmen, we are looking forward to a good business this fall.

W. J. GRADY, General Manager.

**Flour City Ornamental Iron Works.**

Judging from the number of inquiries we have recently had, and installations made during the last four or five months, we anticipate very attractive results, although competition is keen and prices are very close. Good goods must necessarily demand higher prices than the cheaper grades, and as we do not manufacture anything but high-grade ornamental standards, we sometimes find it difficult to convince prospective buyers they should spend a little more money and obtain results accordingly.

WM. BURNS, Vice-President.

**Holophane Works of General Electric Company.**

The outlook in the electrical field for this fall and winter is good, and business should come in fairly large volume, although there is likely to be a lull unless financial conditions improve. There should be, in most lines of work, somewhat of a reaction from what we have had during the past year, as at the present time I feel that there is not sufficient money in circulation to take care of the volume of business which the country, as a whole, is doing.

Under such circumstances there must be more or less of a reaction in business, unless we are to run into a financial panic. I feel that already there has been more or less of this throughout the entire country, and, therefore, good conditions are apt to exist, especially if this reaction is carried somewhat further. Under the circumstances I look for a good business this fall and winter.

V. R. LANSINGH, General Manager.

**Illinois Electric Company.**

I believe the good conditions that have existed in the electrical supply business for the past year are going to continue and even improve this fall and winter. In fact, the jobber of electrical supplies is going to have more trouble this fall in GETTING HIS GOODS promptly from the manufacturer than he is in selling them.

My opinion is based on the reports of our travelers as well as personal talks with many dealers and jobbers throughout the country, and the fact that the country in general is prosperous.

Electrical devices that have been considered conveniences or luxuries, are becoming more and more necessities each year, and as long as the people are generally prosperous and no cause for hard times in sight, they are going to buy them.

N. G. HARVEY, General Manager.

**The Jefferson Glass Company.**

We scarcely know what opinion to offer. Present conditions are fairly good and we see no reason why there should be any marked change in the very near future, unless something unforeseen occurs, possibly something political. We had anticipated there might be a disturbance in trade that could be traced to tariff agitation, but this has not yet made itself felt in our business and we doubt if it will cause any great loss of trade.

We are looking forward to many changes in the electrical lighting development. There will be many improvements and many beautiful things offered in which glass will be a predominant feature.

C. H. BLUMENAUER, President.

**H. W. Johns-Manville Company.**

Our records show that our sales so far this year have shown a very handsome increase in volume over last year. The percentage of profit is also better than last year, and we have every reason to believe that we will have a better fall business than we had last year.

We are increasing our factory facilities all along the line, and also continually adding to sales organization, anticipating increasing future business.

J. W. PERRY,
General Manager Electrical Dept.

**National Metal Molding Company.**

The volume of new building construction throughout the United States is well up to the average of good periods of former years. Purchasers in the electrical field, since the advent of the new administration, have been making their purchases on a very conservative basis. Therefore, the market is in a very healthy condition, there being few surplus stocks. We anticipate a fairly good demand for electrical conduits for the balance of this year, based on the present outlook.

C. E. CORRIGAN, Vice-President.

**Pelouze Manufacturing Company.**

We believe that the present outlook for business is somewhat more encouraging than it was sixty days ago. The banks seem to be more optimistic and are somewhat more liberal in their loans than they were at that time. The average dealer, so far as we can ascertain, is not overstocked at the present time and has been conducting his business more conservatively.

For the immediate future, however, we have two very important matters to overcome and adjust. One is the tariff, and the other the Mexican disturbance. If the present change in the metal schedule goes into effect, it will reduce the tariff from 45 to 25 per cent. We believe it will result in much hardship to many of our metal manufacturers in this country.

With the tariff conditions as they are today, we are obliged to meet severe competition from Germany. It will be seen, therefore, that when the tariff has been further reduced the situation will become more serious. The buyer in one of the prominent department stores of Chicago stated that several of the large German manufacturers had sent representatives to this country to find out exactly what

articles we consumed in large quantities and in several instances had taken samples back to be reproduced or copied.

In order to successfully compete with the foreign market, should the new tariff go into effect, it would be necessary to readjust the wage scale in this country, which is not an easy matter of accomplishment and will likely cause much disturbance before it can be brought about.

This situation especially refers to the metal trade. Other lines may not be affected so seriously. However, the business of this country has always been able to meet new conditions, and in all probability we will be able to take care of any change produced by a lower tariff in one way or another, even though we may have to suffer temporarily.

At the present time we are quite busy and our factory is working at full capacity.

W. N. Pelouze, President.

**Pittsburgh Transformer Company.**

Business is good and as far as our agents' and customers' opinions go they all agree that conditions never looked so well before.

The only thing that is likely to disturb the situation is the price of copper. The copper people in the past have been so entirely irresponsible in making copper prices that their methods always throw more or less of a doubt into the electrical situation.

On the whole, however, we believe that conditions are better than they have been for many years.

R. V. Bingay.

**Ridgway Dynamo & Engine Company.**

So far as we are able to judge, the outlook for business through the fall and early winter is very satisfactory and we confidently look for opportunity to book all the work that we can conveniently handle with our present facilities and organization.

H. A. Otterson, Manager Sales Dept.

**The Safety Insulated Wire and Cable Company.**

The amount of business we have received since the first of the year is considerably in excess of any previous year and has necessitated operating part or all of our works night and day.

From July 1 there has been a slight falling off in new business but the volume is still up to normal.

During the late Fall and Winter months we naturally expect a smaller amount of business in those lines where construction work is interfered with by the weather, but in the spring we expect a considerable amount of new business will be offered on account of the many power and lighting developments now being planned.

G. M. Haskell, Secretary.

**Simplex Electric Heating Company.**

We have had an extremely satisfactory business for the year up to date, and with almost no exception there has been a uniform increase over previous year. The outlook at present seems to be in keeping with the previous months, and we feel confident, because of the constancy and steadiness of the business today, and with the general outlook in regard to crops, that the succeeding months will be in keeping with the former, and that we will round out a highly successful year.

Jas. I. Ayer, Manager.

**Steel City Electric Company.**

It is the writer's opinion that the electrical industries will be kept very busy during the coming Fall and Winter.

With the improved feeling in the electrical trades within the last few weeks, there has been added a definite increase in orders, and while these orders are small, they are for immediate shipment. The jobbers' stocks are evidently very low, as they have been buying only for their immediate needs, and from the urgency of shipments, there is every indication that the consumption will be maintained at the usual rate.

W. I. Patterson, President.

**The Trumbull Electric Manufacturing Company.**

The past six months, in our opinion, have been up to the standard.—in fact as far as our own particular factory is concerned, our gross volume shows a handsome increase and we look forward to a good business this coming Fall. Taking into consideration the various propositions before the public, it is remarkable the volume of business which is still being done and it shows that the people still have confidence in the present situation.

We are looking forward to the average, if not better, business during the balance of the year.

J. H. Trumbull, President.

**The Valentine-Clark Company.**

In my judgment, if the currency bill could be gotten out of the way and the tariff matter settled, money eased up a little, there is naturally going to be a large volume of business, as there is any quantity of work that has been put off from time to time, and it has now got to a point where it must be done. I refer particularly to "pole" business. You can travel by train or tour by automobile across the country and see pole lines in frightful conditions, propped up on fences, temporary wires run through temporary cables, all of which can carry the companies over a short period only, and if they are going to do business or keep in business, they have got to keep their maintenance up to doing business economically, or quit.

As for power and electric light lines, easy money neans new construction, and we have got to have this first, before we will secure a large volume of business.

E. L. Clark, President.

# Among the Supply Men

## Jobbers Play Golf at Hinsdale.

On Friday, August 29, a number of jobbers were the guests of Harry L. Grant, of the Western Electric Company, at a golf party and supper at the Hinsdale Country Club. Among those present were the host and Charles Scudder, Jr., St. Louis; G. A. Cullinan, St. Louis; W. L. Walker, Indianapolis; M. Oberlinger, Indianapolis; Chris Litscher, Grand Rapids; H. P. Andrae, Milwaukee; N. G. Harvey, Chicago; L. W. Schwab, Chicago; W. W. Low, Chicago; F. M. Pierce, Chicago. In addition to the jobbers several manufacturers were present, including B. H. Salisbury and Victor Despard, Pass & Seymour; B. M. Downs, Hemingray Glass Company; E. K. Patton, Bryant Electric Company; E. M. Scribner, Arrow Electric Company; James Wolff, H. T. Paiste Company; T. G. Grier, Harvey Hubbell; Paul Crotty, Weber Company.

A kicker's handicap was played, the winners being Grant, first; Downs, second; Scribner, third; Litscher, fourth; Low, fifth.

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**The Illinois Electric Company, Chicago, Ill., is preparing a new edition of its general supply catalog. This catalog is more complete than ever before, and includes a line of practically every well known electrical manufacturer. It will be ready for distribution to those interested in the early part of this month.**

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Robinson, Nelson & Company, Richmond, Va., reports that the sales for July were the heaviest in the history of the business. Collections have also improved over June and July. This company believes that business is going to be better this fall than it has been for some time. Building operations in its territory seem to have picked up considerably. North Carolina has been especially active in extensions and new building work of all kinds.

# Commercial Practice
# Management, Rates, New Business

## Chattanooga's "White Way."

The historical city of Chattanooga, Tenn., has installed a complete system of ornamental street lighting on its main business thoroughfare. The new "White Way" extends from the Terminal Station along Market Street to Fifth Street. Every night more than a hundred ornamental arc lamps flood this section of the city with light.

The plan for a "White Way" in this southern city was agitated for several years but nothing came of it until Chattanooga was designated for the twenty-third reunion of the United Confederate Veterans which was held last May. The city was also selected for another great reunion this year when the National Encampment of the Grand Army of the Republic will be held on the battlefield of Chickamauga this month. These two great reunions of the Gray and the Blue stimulated civic interest in the ornamental system of lighting and the new lamps were quickly installed. The "White Way" consists of 114 ornamental luminous arc lamps, designed by the General Electric Company, mounted on ornamental poles. These lamps are spaced about 85 feet apart, directly opposite each other, along the entire route. The wiring for the new lamps is all concealed in conduits under ground, doing away with overhead wires and unsightly hanging lamps. In this way the new system is made as ornamental by day, when the lamps are not in use, as by night when lighted.

The installation cost was paid for by the merchants along Market Street. This cost was about $3 per front foot. The Chattanooga Railway & Light Company has agreed to furnish the current free for a period of two years. The city will pay for the upkeep of the system. The ornamental poles were made in Chattanooga.

The new "White Way" was completed in ample time for the Confederate Veterans reunion which was held there last May. The turning on of the lights was made a great event and the occasion of a celebration. As usually the case in every community there were a few business men who did not at first realize the value of "White Way" lighting and refused to contribute. The unique manner in which this problem was solved in Chattanooga was effective as well as interesting. The new lamps were installed throughout the entire "White Way" but were not lighted in front of the business places which had not contributed. In this way the dark spots were made conspicuous, so much so that those who had not contributed hastened to do so.

It is estimated that 100,000 people visited Chattanooga during the Confederate reunion. Even more are looked for at the forthcoming Grand Army encampment.

Market Street, Chattanooga, Tenn.

Illumination of Market Street at Night.

## THE CHAIN.[1]

**By Thomas Chandler.**

Most central stations, in dealing with customers, have the following departments or sub-departments, which form the chain which connect them with the public, the principal of which, might be noted as follows: (1.) New-business department; (2.) Meter department; (3.) Trouble department; (4.) Billing department; and (5.) Collecting department.

If the first link in this chain,—the new-business department—is weak, the entire structure fails for there is very little for the other departments to do.

The strength and growth of any public-service corporation depends largely upon whether its new-business department is a live wire or is simply dragging along, five or ten years behind the times. What success would a weak new-business solicitation have against a competing gas or electric company employing a few live-wire solicitors?

Naturally, the weakest solicitation for business occurs in small towns where no competition exists. Oftentimes in this class of plants, this link is left out of the chain entirely, and this is almost always the case in small

1 Extracts from a paper presented before the Michigan Section, N. E. L. A., convention, Ottawa Beach, August 19-21.

plants under municipal control, and accounts for many, if not most, of the municipal failures. Then again, many small plants only serve from dark, say 3:00 p. m. to 4:00 or 5:00 a. m. Sometimes as a special accommodation, the plant is run one day a week on Tuesdays for ironing. In the case of a waterpower plant, how much extra would it cost to give 24 hours' service and to get after and secure the day business—fans, irons and small power. The gain in income for this class of business is usually very surprising. Getting new business half way, or, in other words not geting all the possible business out of the community is a weak point in our chain, and determines the result of the business as a whole.

Of all the departments, the one which comes into closest contact with the customers, and therefore the most important, is the meter department. People form their opinions of a company from the class of men it employs. From them, they learn of its careless or precise methods; of its honesty, of its policy to accommodate or to show utter disregard for the public.

Often we find, the meter reader, many times a mere boy, rushes to the meter, takes a quick reading and rushes out on his way. Is it surprising that the lady housekeeper thinks, after several months repetition of this, especially, when she gets a high bill, that the meter is not read at all, but simply guessed at and the bill made accordingly. Such ideas are very easy to inculcate, but very hard to remove, when once they become established. She is convinced that the boy has not had time to read the meter, and that readihg anyhow is just a blind. The reader may have taken time, but it would be hard, in many cases, to convince the customer that such readings are anything but a joke.

Some customers ask for reading of the meter at the time, and we have known of their being told gruffly, that they will get their bill in due time, or to call at the office, or they haven't time, or some such remark. Suppose the reader to be a carelessly dressed, slovenly fellow, dragging his heels, or so much of a talker that he tells all the company's business he knows; about Jim Jones meter being 10 per cent fast, or John Smith caught stealing current. What customer would have the utmost confidence in such boys or men, and what opinion have they formed of the company from its employes?

On the other hand, our meter reader should be more than a mere boy, neatly dressed, with a business-like courteous manner. Behind each meter may be left a memo giving the date, meter number and the reading with a regular form request for the customer to check his reading, and if correct, to compare with his next month's bill, and in case of a difference, to notify the office, so that the company can investigate. The result would tend to give the customer more confidence in the readings, encourage them to check their bills more intelligently, and also probably make the meter readers use more care in their reading work.

In the testing of meters in service, the same manner of doing the work along with the type of men who do it, has just the same educational effect on the customer; he learns by quick observation whether the work is done precisely, or done carelessly. If done carelessly, he sees this and has very little confidence in the meter testing, or the accuracy of the meter.

Testing the meters in shop does not come under the customer's personal observation, but the discipline or lack of discipline in doing work by precise methods has a moralizing or demoralizing effect on the other men who are actually doing the work among the customers.

The methods and forms of reports of tests, installations and removal of meters, also plays a very important part in the accuracy of the work. Excess of red tape is often as much a source of error as lack of proper system.

Our meters and their care are the very foundation upon which, through the sale of current, our business is built. In fact, the meter-department work comes nearer to our real treasury than any other department, except the treasurer himself. It is in this department that we can have a weak link or strong link in the back-bone chain of our business management.

Nothing requires prompter attention than looking after trouble. Nothing will cause dissatisfaction quicker than failure to fix fuse outs promptly, or failure to find the real seat of the trouble, thus leaving the customer without light. The same education of the customer applies here, just as it does in the meter department. Are we to send men who only half fix trouble, or say that it is up to someone else, or that the meter is burned out, or some other such excuse. No, that is not what we want. We want men, who at least appear as if they knew something, and are just the opposite in manner of work to the plumber who has to go back to the shop for his tools.

The actual billing is not seen by the customer, but he does see the bills and he does remember when there is a clerical error in his last month's account, or when he gets a statement which he has paid.

In most companies, the meter reading dates, and readings together with the net consumption, are put on the statement. The customer rarely notices the dates or readings, unless they particularly stand out, but he does notice the amount of his bill in dollars and cents. Suppose his meter was not read last month—he gets a large bill next time, and he is not quite satisfied, never noticing the meter readings or dates. Suppose the words "Two Months' Bill" were stamped on the bill with a rubber stamp. This would attract his attention, and bring to his memory the fact that he received no bill last month. Probably in most companies five per cent of the meters are not read each month. Is it not better to mail a blank statement showing "Meter Not Read This Month?" All these little things, properly looked after build up a stronger chain between the customer and the company. Even the proper thing done in an antagonistic way produces a most dissatisfied customer.

Next to getting the business and keeping it, comes the question of collecting the money. This branch of business probably requires more skill and tact than any other department.

The majority of the central stations use the discount system for collections, which works out better in a large city than in a small town, where the company is a local one. In the small town any variation from the iron-clad rule of discount date would be disastrous, but on the other hand, once a customer loses his discount, it is hard to collect from him, or to make him a satisfied customer.

It has been the writer's experience in a small town, that personal letters, especially with a little personal tinge to them, tend to bring collection results better than anything else. It would not seem that the size of the town would make any material difference in results in this respect from those shown in a small city.

Experience has shown that it is a combination of well worked out little details of business that make the strong links, and that it often appears that some hitherto strong links, become in comparison, the weak ones, which have to be strengthened by the same close attention to some other small details, until every link in the chain becomes equally strong with every other link. To secure and maintain this position requires eternal vigilance.

The standing of a light and power company in its own town, is just what it makes itself, that is, it is just as strong as its weakest link; whether that weak link be in the meter department, or in the collection department, or any other department.

## Binding Books by Electricity.

Electric power is extensively utilized in the binding of books in modern plants one of the most complete electrical equipments being employed at the Williams Book Bindery in New York City as seen in the accompanying illustrations.

In this bindery there is installed a battery of six Dexter folders with mechanical feeders. The motors for these folders are started and stopped by means of two-button push butons. There are six of these located at different points about each machine, so that the attendant may stop or start the machine from any position.

It may be stated that these push buttons control an automatic starter for the motor. A field rheostat is also installed, and by setting this the foreman in charge can arrange for any given speed, so that the attendant need only operate the controlling buttons. The automatic starter, field rheostat, main line switch and fuses are mounted on a slate panel set up within the framework of the folder.

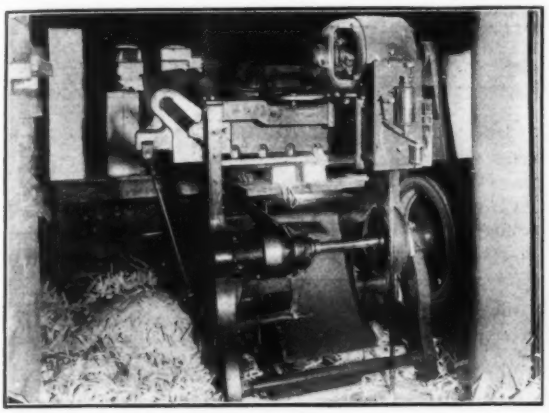

Fig. 1.—Paper Cutter.

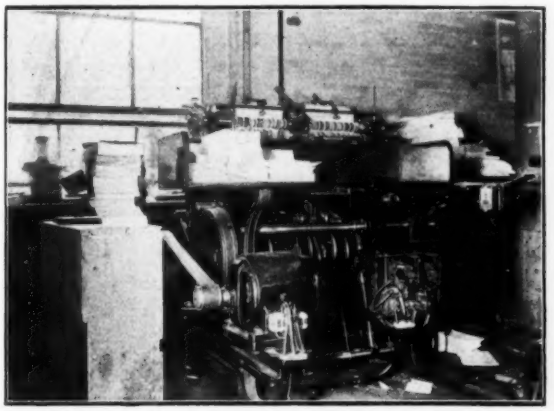

Fig. 2.—Pasting Machine.

Fig. 1 shows an electric cutter at work the motor of which is started and stopped about once in every 10 minutes. This machine is driven by a two-horsepower compound-wound motor, operating at a speed of 1,100 revolutions per minute.

The pasting machine shown in Fig. 2 is driven by a 0.5-horsepower shunt-wound motor operating at a speed of 600 revolutions per minute and equipped with a dynamic brake. It is stated that the motor with an automatic starter, and dynamic brake makes this machine manageable by a girl attendant.

The rounder and backer, Fig. 3, is a slow-moving machine used for rounding the back of a book. Usually the electrical application consists of a hand-operated rheostat, a motor and a foot switch to open the holding coil of the rheostat when the brake is worked. When it is desired to reverse the machine the flywheel is pulled back by hand. The new equipment consists of a 1.5-horsepower electric motor of the compound-wound type operating at 500 revolutions per minute and fitted with a foot switch. Considerable time is saved both in the frequent use of the hand starting rheostat and in the cumbersome method of pulling back the flywheel by hand.

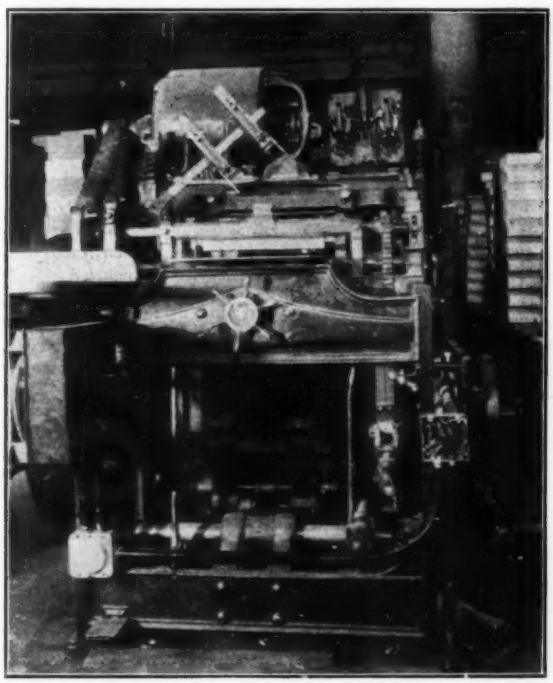

Fig. 3.—Rounder and Backer.

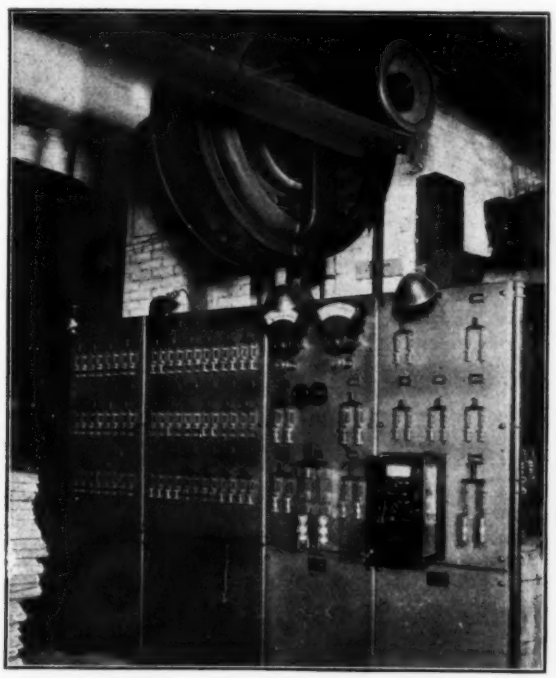

Fig. 4.—Switchboard.

# Electrical Construction

## THE ELECTRICAL WORK ON A LARGE PUBLIC BRIDGE.

### Construction for Outline Lighting and General Illumination of the Broadway Bridge in Portland, Ore.

Once a year, about the first of June, Portland, Ore., lays aside her business cares for a week and devotes her energies toward the proper celebration of the famous Rose Festival. This event is staged at a time when the flowering season is at its height. In Portland there are compraratively few homes that do not grow roses in several varieties. The Rose Festival is held when the city is virtually abloom with these, and during the celebration boats, buildings, vehicles—everything is literally covered with roses. Moreover, the streets in the main business sections are made gay with flags and bunting, and the principal stores and office buildings vie with each other in an attempt to produce the most striking electrical displays. Outline lighting and streamers of white and colored lights, draped in beautiful lines or arranged to produce some beautiful design on the face of the building are seen everywhere.

The city, too, enters into the spirit of the occasion and erects long streamers of lights across the streets and clusters of them at the principal street intersections. It is certainly fitting, therefore, that the Willamette river, which forms Portland's harbor, should have received some attention in the matter of decoration; moreover, decorative lighting on the river bridges serves the double purpose of lighting the harbor and also some of the principal thoroughfares at the same time.

The cost of erecting sufficient streamers on the bridges each year and of taking them down again was no small item. This was pointed out to the City Council during the winter of 1911-12, and the suggestion was made that it would be more satisfactory to install a permanent decorative lighting system which could be put into service whenever it was wanted at a very small expense. As a result, $15,000 was appropriated for the purpose of installing decorative lighting of a permanent character on the Hawthorne, the Morrison and the Burnside bridges, the three principal municipal bridges then spanning the river.

A system of outlining was designed for the three bridges which would bring out the principal bridge members of each and yet keep within the limits of the appropriation, the conditions of the appropriation being that in addition to the decorative lighting a satisfactory system of permanent regular lighting consisting of brackets and boulevard posts be provided for each bridge also. This left a very small working capital, but the installations were designed and the work was completed just in time for the Rose Festival of 1912. The effect was so eminently successful that it dispelled all doubt as to the wisdom of the appropriation.

The decorative system was used again during the Elks' convention which occurred about a month later. The lamps, which were eight-candlepower carbon units, spaced upon 24-inch centers, were left permanently in the sockets—it being assumed that it would be much less expensive to replace the broken lamps each time the system was to be used than it would be to take them all out and put them back again. Nine months after the installation was completed, a test was

Fig. 1.—Illumination of Approach to Bridge.

Fig. 2.—End of Bridge, Showing Both Post and Bracket Lighting.

made to determine just what the loss in lamps had been. It was found to be about 2.5 per cent, thus proving conclusively that it would not have paid to take the lamps out and store them.

Allowing 25 per cent for depreciation and interest on the investment, and making a liberal allowance for the replacing of broken lamps and fuses, it is estimated that the cost of the decorative lighting will not be more than $300 per year. This sum would be insufficient for the installation of temporary decorative lighting for even one of the bridges, and when the temporary lighting was installed it would not be as efficient and satsifactory as the present system.

During the summer of 1912, the new Broadway Bridge was nearing completion. It is a steel bridge of the Rall Bascule type, 1,740 feet long, with a 50-foot roadway for railway and vehicle traffic, provided with double tracks for both broad and narrow-gauge electric-railway service, and on either side of the bridge is a 10-foot sidewalk for foot passengers. On the east end of the bridge there is a 300-foot concrete approach, while on the west end a steel viaduct 430 feet long crosses the railroad tracks of the Union Depot and connects the bridge proper with another concrete approach 460 feet long. The bridge has a normal clearance of 85 feet above high water, and when open provides a clear channel 278 feet wide for the passage of any vessel in the harbor. The government requires a horizontal clearance of 250 feet.

The bridge opens into Broadway Street on the East Side and into what was originally Seventh Street on the West Side. Seventh Street traverses the newer business section of Portland and it is the intention to make it one of the leading business streets on the West Side. As one step in that direction, the city council a few months ago passed an ordinance renaming it Broadway, so that the new bridge now connects the Broadway on the East Side with Broadway on the West Side.

The new Broadway already numbers among its buildings many new office buildings several of the leading hotels and theaters. The United States Custom House and the new $1,000,000 post-office building. At the same time it leads directly into the district of the North Bank and Union Passenger Depots. Since this is to become so important a thoroughfare it was essential that the bridge be well lighted. This, together with the satisfactory showing made by the lighting of the other bridges led the council to make a generous appropriation for both regular and decorative lighting of a permanent character for this bridge.

Bids were obtained on three different systems of decorative lighting but the one finally selected consisted of four-candlepower carbon-filament lamps spaced 18 inches apart. The upper and lower chords as well as the principal vertical members of the bridge were outlined with these lights, about 7,000 lamps being used for this purpose.

The regular bridge lighting was accomplished by means of standard five-lamp boulevard posts, on the east and west approaches to the bridge. The posts are placed opposite each other across the roadway and spaced about 60 feet apart along either side of the approaches, 31 posts being used on the west approach and 12 on the east approach.

The four pendant lamps on each post consist of 100-watt tungsten lamps inclosed in 12-inch globes. The upright lamp in the center consists of a 60-watt tungsten lamp inclosed in a 16-inch globe. Both lamps and globes on the posts as well as the brackets are protected by shock-absorbing devices which will be explained later.

The bridge itself is lighted with two-lamp brackets mounted in pairs, one on either side of each of the principal vertical members of the bridge structure. These groups of four lamps are placed opposite each other across the bridge and spaced about 50 feet apart. The lamps hang pendent and consist of 100-watt tungsten units inclosed in 12-inch globes.

All the post and bracket lights burn from dusk until midnight, while from midnight until daylight the "owl lights" only, burn. The "owl lights" consist of every fourth group of bracket lights or every fourth post. To facilitate their control these posts and brackets have been grouped upon separate sets of feeders called "owl feeders." The lamps to be thus left burning are staggered on either side of the bridge, thereby producing a more uniform distribution of light.

The decorative lighting system is operated from the main feeders which are used for the rest of the bracket and post lights, the decorative system being locally controlled by means of branch switches mounted in the branch cabinets placed on the principal vertical members of the bridge. When the decorative system is being used it will be burned during the same hours that the balance of the regular lights are used and the main feeder switches can be used for the control of both at the same time.

The Portland Railway Light & Power Company brought 10,000-volt service to two 50-kilowatt transformers located on top of the pier at the west end of Span III for feeding the west side of the bridge. At this place the voltage is stepped down to 120-240 volt, three-wire service. This service passes through an automatic oil switch placed under the floor of the bridge and enters the main distributing cabinet located above the sidewalk level. This cabinet contains the meter, the control for the oil switch, and the switches and cutouts for the various branch feeders. A pair of three-wire feeders is carried under the floor eastward to the lift span, one on either side of the bridge; another pair of feeders is carried westward in a similar way under the bridge and approach. From these feeders, branches are carried up into the posts or into switch cabinets located on the bridge structure beneath the bracket lights in each case. These feeders supply the decorative system and the regular post and bracket lights, with the exception of those designated as "owl lights." A three-wire "owl" feeder is carried in the same conduit with each of the four regular feeders above mentioned, for the purpose of supplying the "owl lights."

In addition to the above feeders, another one is carried directly to the bridge operator's house for the purpose of supplying the gate lamps, the operating and the machine-house lamps and the signal lamps for the west lift of the bridge. In

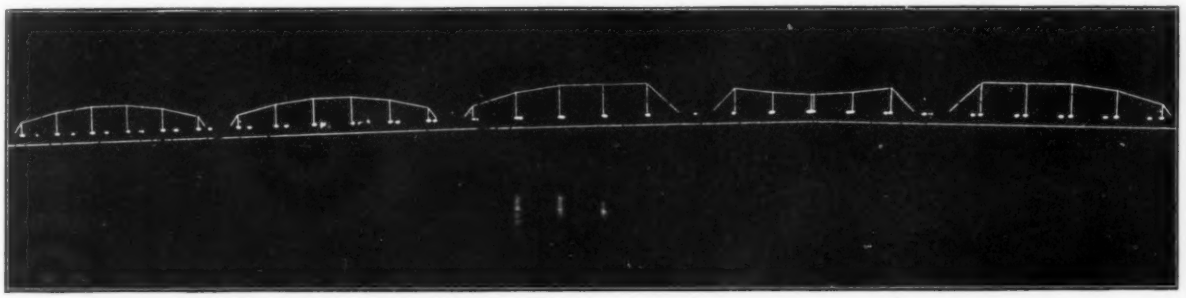

**Fig. 3.—Showing Distribution of Lamps for Regular Bridge Illumination and of Lamps for Outline Lighting.**

order to insure service, these lamps are so arranged that they may be cut over through a resistance onto the 500-volt service which supplies the power service for the operation of the bridge.

For supplying current to the east side of the bridge, 10,000-volt service was also brought to a 50-kilowatt transformer placed under the sidewalk at the point where the bridge joins the east approach. Here the service is stepped down to the proper voltage, carried through an automatic oil switch and into a main distributing cabinet, where it is handled in a manner similar to that described for the west side.

The wiring is all done in metal conduit and all conduit, cabinets, and fittings are of the best grade of galvanized iron and have been given three coats of best quality bridge paint.

A few more things of special interest in connection with this installation are deserving of mention.

The types R J and R K Crouse-Hinds condulets were placed upon the market just in time to be specified for this installation and were used throughout for the outline work. They are undoubtedly excellently suited for this class of work, because of the flat back which keeps the lamps properly lined up at all times, the

Fig. 4.—Design of Shock Absorber Used.

room inside for making electrical connections, the substantial receptacle provided and the reasonable cost, all of which are very essential features of an installation of this nature.

The lift span is pivoted about 25 feet above the floor of the bridge and moves back as it raises. In order to avoid a break in the circuit every time the bridge operates, the main feeders are carried up to a point on the upper chord of the anchor span about 35 feet above the bridge floor. From this point they are carried in a flexible-steel conduit onto the nearest fixed point on the lift portion of the bridge; the feeders through this flexible-conduit loop, which is about 30 feet long, are also composed of flexible conductors. This keeps all the lamps lighted during operation of the draw.

In order to reduce lamp and globe breakage to a minimum, simple shock absorbers were provided, the requirements being that the absorber must support the lamp and socket in such a manner as to take up the bridge vibrations and at the same time keep the lamp centered in the inclosing globe. As constructed the absorbers of a strip of fiber about one-eighth of an inch thick by two inches wide and long enough to wedge firmly into the bell of the bracket or post where they were securely fastened by screws. A coiled brass spring is attached to the center of this fiber strip and on the other end of the spring is brazed a brass nipple for receiving the socket.

A spring brass collar rolled to conform properly to the curvature of the neck of the globe was provided for each globe. The Portland Railway, Light & Power Company has found this to be one of the most satisfactory methods of supporting the globes on their boulevard posts, but as an additional precaution, it was required that two-inch lengths of heavy rubber tubing be slipped over the brass collar and placed so as to receive the pressure of the set screws used to hold the globe in place.

Another feature requiring special consideration was the method of handling the bracket lights on the bascule lift spans. These spans during operation occupy every position from a horizontal to vertical one. It is evident that the ordinary method of supporting the lamps and globes could not be used if the brackets were rigidly fastened to the bridge structure. This difficulty was overcome, however, by attaching the bracket to the bridge by means of a pivot support in the top of the bracket, using the weight of the casting to keep it always in a vertical position. This has proved entirely satisfactory in operation and permits the lamps and globes to be supported in the same manner as in the case of the other brackets previously described.

The illumination on the bridge and approaches is of high intensity and the uniformity on the bridge proper has probably never been exceeded. This is shown very clearly in one of the cuts where no spot light on the floor of the bridge can be detected.

Due consideration was also given to the effect produced by the bridge as viewed from the side and at a distance. The clusters of lights form a line of white which brings out very distinctly the long sweeping curves of the floor of the bridge. The decorative system emphasizing the principal lines of the structure produces a bridge of lights which can be seen for miles down the river by any one entering the city either by train or by boat.

The installation of the system herein described was ably handled by the West Coast Engineering Company, electrical engineers and contractors of Portland, and the installation was completed in 67 days, or 8 days ahead of contract time. The system was designed and the specifications drawn by F. H. Murphy, illuminating engineer for the Portland Railway, Light & Power Company.

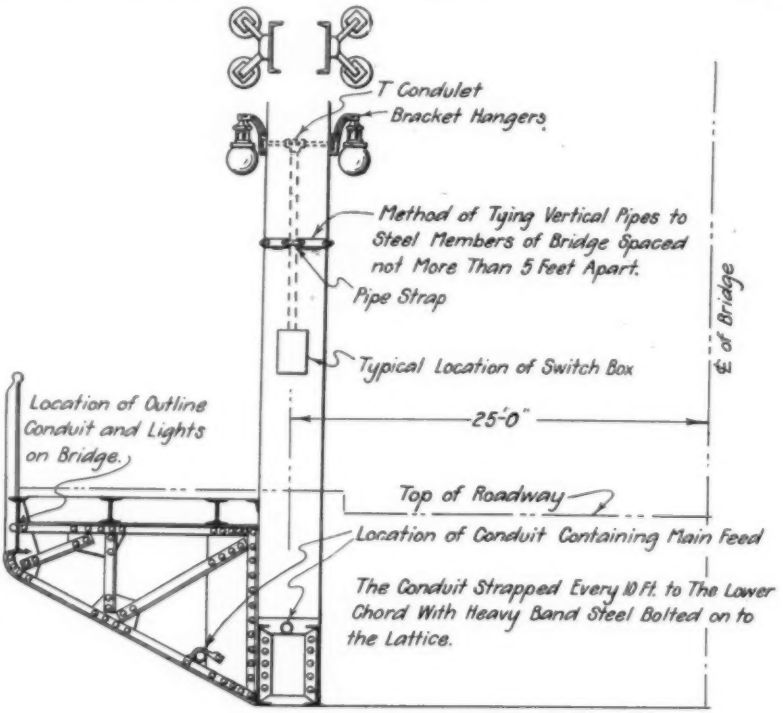
T Condulet
Bracket Hangers
Method of Tying Vertical Pipes to Steel Members of Bridge Spaced not More Than 5 Feet Apart.
Pipe Strap
Typical Location of Switch Box
℄ of Bridge
Location of Outline Conduit and Lights on Bridge.
25'-0"
Top of Roadway
Location of Conduit Containing Main Feed
The Conduit Strapped Every 10 Ft. to The Lower Chord With Heavy Band Steel Bolted on to the Lattice.

Fig. 5.—Some Details of Wiring.

## Sheffield Municipality and Electrical Contractors.

The City of Sheffield, England, some time ago had a prolonged struggle with the electrical contracting interests of the city and indeed of all England. In connection with its electricity department it ran a highly successful electrical contracting and sales department, which local contractors objected to as in excess of authority contained in the City Acts. The result was a fight in the courts and sub-

sequently tussles before Parliamentary committees and in Parliament itself, which resulted in a greater recognition of the rights of the private contractor, and a limitation of the privileges of the municipal electric supply department. Consequently much attention has for some time past been devoted to devising a scheme for future working in which operations could be most conveniently and equitably carried on. A proposal has now emerged from the special committee providing as follows:

(1) That a showroom be maintained for the exhibition of electrical fittings, including such electric lighting fittings as the corporation can only sell through a contractor carrying on business independently of the corporation.

(2) The following method of selling such electric light fittings is to be adopted: (*a*) a list of electrical contractors willing to agree with the corporation to sell electric light fittings on agreed terms will be prepared and maintained; (*b*) the corporation canvassers and showroom attendants will be supplied with this list, and authorized to inform customers that the corporation will sell to them, through any of such electrical contractors, such electric light fittings as they may require, and to request the customer to arrange accordingly; (*c*) that all such electrical contractors and their customers be allowed access to the corporation's showroom for the purpose of inspecting and selecting electric light fittings, and arranging between themselves for the sale and purchase thereof.

(3) That an invitation be given to all electrical contractors in the city to place their names upon the list of contractors.

The production of coal in Alabama in 1912 was 16,100,600 short tons, valued at $20,829,252.

## IMPROVING A RADIO INSTALLATION.

By E. F. Lathrop.

A faulty arrangement of the wireless leads from the aerial to the deck of an excursion steamer is shown in Fig. 1.

Fig. 1.—Initial Arrangement of Aerials.

The wires were brought from the end of the aerial near the main mast to a point above the insulators and bushings on the deck, and tied with a small rope leading to a flag pole at the side of the steamer. The tie line was equipped with a strain insulator. The lower end of the leads for a distance of 6 feet above the insulators was inclosed in hard-rubber tubing. In order to make the wires taut, it was necessary to secure the leads near the flag pole, causing the lower ends to be inclined over a portion of the deck used as a passageway, and, to protect the passengers, the deck was roped off, causing them to pass on the opposite side of the steamer.

An inexpensive improvement in the installation is shown in Fig. 2. The leads are attached to a rope extending between the flag poles on opposite sides of the steamer at a point directly above the insulators, and are brought down vertically in the hard-rubber tubing, obviating the necessity of roping off a portion of the deck.

A more permanent method is shown in Fig. 3. The rubber tubing is attached to a board 7 feet long, 6 inches wide and 1.25 inches thick, erected between the insulators and the railing surrounding a skylight in the center of the deck. An angle iron secures the lower end of the board to the deck, and a three-eighths by 2-inch strap iron fastens the back of the board to the railing.

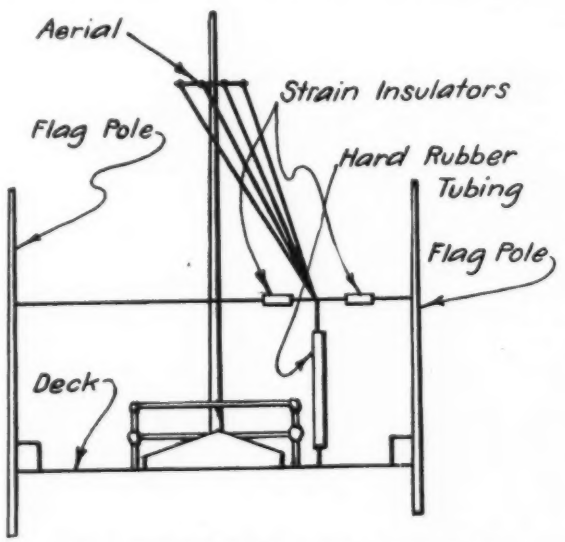


Fig. 2.—First Modification of Initial Construction.

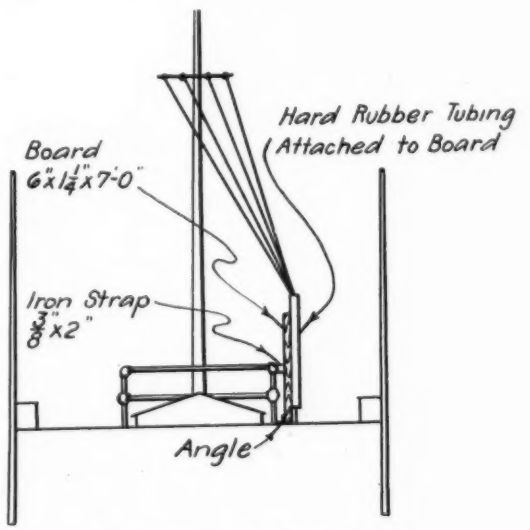


Fig. 3.—Construction Finally Adopted.

## Panel-Boards Insure Safety.

*Safety Engineering* says that the safe and economical distribution of electric current in large installations has for some time been effectively handled through the use of panel-boards. The general simplicity and practicability of panel-boards has been thoroughly established through years of experience and their absolute safety is undeniable. It is unquestioned that they have become a generally accepted standard the world over. In many cases in place of panel-boards separate main fuses, switches and branch cutouts are used, all installed separately, often at widely divergent points with open or semi-open connections between. It is apparent that such installations are insecure, unreliable and unsafe as compared with a panel-board.

## Among the Contractors.

Electrical contractors of Louisville, Ky., had a big time Labor Day, participating in the annual outing of the Builders' Exchange, which was held at Hike's Point, a few miles east of the city. A baseball game, in which the subcontractors, including the electricians, played the general contractors, and a country dinner, in which fried chicken, Kentucky style, was the *piece de resistance,* were the big features of the outing. Among those taking part were A. J. Anderson, Gus Albrecht, Jr., and James McWilliams.

L. K. Comstock & Company, 402 First National Bank Building, Chicago, has recently been awarded two large contracts for electrical work by the Marshall Field Estate. One of these is the electrical work in a building at No. 25-32 East Washington Street, Chicago, which installation will consist of 10,416 incandescent lamps, and motors which number 35 and aggregate 337 horsepower. The other installation will include about 15,000 incandescent lamps and 260 horsepower in motors, this job being in a building on North Wabash Avenue, Chicago.

The Board of Control of Montreal, Canada, has awarded the contract for underground conduits on St. Catherine Street, between Guy and Atwater Avenue and along Bleury Street, between Craig and Pine Avenue to G. M. Gest, the lowest bidder. The tender price for the St. Catherine Street section is $45,969, and $128,418 for the Bleury Street section. The awarding of the contract will mean that the contractor will get an early start on the work, he now being engaged in laying the conduit on St. Catherine Street as far west as Guy Street. All tenders accepted are approved by the Electric Service Commission, which drew up the plans, subject to the approval of the Quebec Public Utilities Commission.

Kohler Brothers, a Chicago firm, is doing the electrical work in a building recently erected by the O. S. Richardson Coal Company in Chicago. Circuits for lighting and for 600 horsepower in motors are to be installed.

C. Grunhow, of Chicago, will do the electrical work in the new Carter Harrison Technical High School, in Chicago. Wiring for 3,000 incandescent lamps, 17 arc lamps and 45 motors is to be installed.

The Devere Electric Company displayed its line of electric fixtures during the Made-in-Cincinnati exposition, held in that city August 25-30. Booths were erected by the manufacturers in Fountain Square, in the heart of the downtown district.

## Alex M. Knauber.

Enthusiasm is the keynote of success. Whatever a man's resources, and however great his ability, he is not apt to do very well in a vocation that he does not like. In order to achieve the largest measure of success he has got to have that degree of enthusiasm that grows out of the feeling that the vocation he has chosen is the only one for him. The man who gets no joy out of his work had better make haste to seek employment of another kind; he is quite liable to have to seek it sooner or later. In a casual conversation the other day Alex M. Knauber was asked whether he ever had any inclination to go into a certain business that is lately growing in popularity and profitableness. His answer was, "I have no inclination to engage in any business other than the one I'm now in." Mr. Knauber is in the electrical contracting business, and he is making it go. A man with his enthusiasm for the work is bound to. He is the president and manager of Alex M. Knauber Company, a concern which does business in Oak Park, Ill., and at 1642 West Madison Street, Chicago.

Alex. M. Knauber, President of the Faraday Electrical Association.

Mr. Knauber was born in Buffalo, N. Y., in 1873. He began his business career as a dealer in wall paper and decorators' supplies, and eventually became known as one of the best salesmen dealing in this line of goods, in the community. While engaged in handling wall paper in Chicago he was induced to take on a certain line of gas-lighting fixtures as a side line, and this led to his attention being called especially to problems in house lighting. He saw the advantages of electric lighting, and became convinced that he could make money putting in installations for this sort of illumination. He therefore gave up his former business and became a partner in a small electrical contracting concern. Here he looked after the business side of the firm's affairs and made a constant study of the best methods of electrical construction. As soon as he felt that he had sufficient experience, he went into business for himself under the firm name noted above.

Alex M. Knauber Company specializes in the installation of electrical work for residences, apartment houses, stores, garages, small theaters, and the like. It is doing a large share of the work of this character on the West Side in Chicago and in the western suburban towns. And, withal, it has put in some of the best installations to be found here.

No electrical contractor is now recalled who has a keener appreciation of the value of advertising than has Mr. Knauber. If Knauber is doing the job, one will know it as soon as one passes the house; for the minute his men begin work he nails a sign in a conspicuous place stating who is putting in the electrical installation. This is one of half a dozen methods of his for advertising.

During the last two years or so Mr. Knauber has done quite a little along the line of invention. He has recently perfected and placed upon the market a cleat which takes the place of the customary piece of timber for supporting outlet boxes, which is proving very popular; and a new type of mail box is another invention of his.

Mr. Knauber is president of the Faraday Electrical Association, of Chicago; he is also a member of the National Electrical Contractors' Association, and of the Electrical Contractors' Association of the State of Illinois. He has membership, too, in the Oak Park Council of the Knights of Columbus, and in other fraternal and technical organizations. He is a most likeable sort of fellow, whose friends are numerous, and among whom it is a pleasure to be included.

## New Edition of National Electrical Code Ready.

The 1913 edition of the National Electrical Code has made its appearance. Changes have been made in a number of the installation rules, but all of the more important of these were enumerated in our issue of April 5. They include: the revision of Rule 15 making the grounding of low-potential circuits mandatory; changes in Rule 23 to specify 16 sockets as the maximum number for a branch circuit, and 10 amperes as the maximum rating for the fuse protecting a 660-watt branch circuit in interior wiring; a revision of the table of carrying capacities of wires so as to permit somewhat heavier currents on wires of the sizes mostly employed in inside work; etc.

Copies of the Code can be obtained from the local insurance inspection board—that is, application for them should be made to the insurance inspection department, or board of underwriters, having jurisdiction in the applicant's territory.

# National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, vice-president, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. LATTA, assistant secretary, 608 South Dearborn Street, Chicago, Ill.

*Executive Committee*

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel, R. P. Strong, Henry A. Knight, C. H. Fletcher
Washington Devereux, James B. McCarthy, James H. Fenton
R. J. Forsyth, C. W. Mitchell, A. W. Hopkins, G. W. Perry
George L. Collison, T. H. Fritts, A. H. Soper
T. W. Bowry, F. G. Hartwell, A. A. Moffitt, Thomas D. McColl

## Secretary's Message.

C. S. Andres, C. G. Bergendahl, J. W. Goetsch and R. L. Shearer, have ceased to be members of the Association.

Members of the Executive Committee will please note that in the set of suggested by-laws recently sent them the following phrase was omitted from Article II in some of the copies: "All applicants for membership shall submit their applications to the Secretary, who shall refer the same to the Executive Committee, and upon the approval of the latter they shall become members of this Association. The membership fee, payable upon sending in the application, and to be returned in case of nonelection, shall be one dollar ($1.00)."

In regard to the questions appearing in this issue it would seem as though some of the answers to Question 236 were a little wide of the mark; the copy from which the Secretary wrote his set of questions unquestionably said "Rule 77*c*"; if this was a slip for Rule 77*c* it would put a different face on the matter, and I think that many of the gentlemen replying to the question assumed that Section *c* was what was meant. I wish that in reading the replies to the questions, readers would bear this in mind.

The Secretary particularly requests those members who have not as yet responded to his bill for dues sent out some time since to please do so. The expenses of this Association are increasing and cannot be met without the funds which are supplied by the annual dues. The amount in no case can be considered large, but in the aggregate (where members persist in letting the dues run two years or so) reaches quite a sum, and if all would pay promptly it would help the Secretary considerably. There will have to be quite a little printing done within a few weeks, which makes the Secretary particularly importunate at the present time.

Another thing: from time to time during the past year the Secretary has printed in his message (as was the case in the message of August 2) some query or matter of interest in regard to which he has requested information or comment from the members at large as well as others interested. So far as he can tell from the results, none of the members read the matter at all, or are not sufficiently interested to write him. The value of our work would be greatly increased and the interest of all stimulated if only some replies and comments could be extracted in response to these matters, and the Secretary could make excellent use of the material so gathered.

The Secretary wishes to announce that Edward Hughes, electrical inspector for the City of Victoria, B. C., has become a member of the Association. His address is 1539 Bay Street, Victoria, B. C.

**The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.**

**It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.**

**The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.**

## Use of Receptacle.

**Question 236. Would an approved receptacle having porcelain projecting out to the edge of the terminals (a style of which Bryant Receptacle No. 4013 may be taken as an illustration) placed on a ceiling and inclosed in a canopy, be considered to violate Rule 77e?**

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Answer 1 (D). We would consider the placing of any type of rosette within a fixture canopy to be dangerous practice, to say nothing of the unnecessary expense incurred.

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Answer 2 (P). I should consider this is a violation of Rule 77*e*, unless the receptacle were placed in an approved outlet box.

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Answer 3 (B). Rule 77*c* refers to markings in connection with fixtures. The use of a receptacle inclosed within a canopy would not, in our judgment constitute a fixture as covered by Rule 77. Furthermore, a receptacle with exposed terminals such as is referred to in the question, if inclosed in a canopy, does not constitute either proper or safe construction, and ought not to be permitted.

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Answer 4 (I). Rule 77*c* states that receptacles having exposed terminals must not be used in canopies. In our opinion the placing of the sort of receptacle mentioned in this question in a fixture canopy would be a distinct violation of this rule. The receptacle was probably never meant to be so used.

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Answer 5 (Y). According to my interpretation of Rule 77*c* this would not be approved.

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Answer 6 (C). Yes; this sort of construction would be getting back to the old "bug" cutouts that used to be installed in canopies, and the old faults of allowing live metal parts to be exposed to gas pipes and canopies.

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Answer 7 (O). This construction is in direct violation of the rule mentioned.

Answer 8 (F). Yes; this receptacle might introduce considerable hazard with some types of canopies.

Answer 9 (S). Yes.

Answer 10 (J). Yes, unquestionably.

Answer 11 (M). Yes.

Answer 12 (E). If the receptacle were of an approved type, I do not think it would conflict with the rule mentioned. I fail to see the need of a canopy, however.

Answer 13 (U). Code Rule 77*c* says receptacles having exposed terminals must not be used in canopies nor in any part of a fixture unless they are completely inclosed in metal. The receptacle referred to would have to be in a metal outlet box, and I see no way of fastening the canopy with such an installation.

Answer 14 (N). Rule 77*c* simply says that fixtures must be marked with the maker's name or trademark. The first question, then, is, Does this combination constitute a "fixture"? If not, then this section does not apply at all. Considering it as a fixture, the receptacle will be properly marked if on the approved list, and if the canopy is also marked with the maker's name, I do not see but that the rule is complied with. Obviously the rule has nothing to do with the construction from an engineering point of view.

### Filling Countersunk Bolt Holes.

**Question 237. What is the purpose of the filling applied to countersunk boltheads on marble or slate slabs supporting resistance boxes, called for in Rule 4a? Is it intended to insulate against electricity or heat? If the former, why is not an insulating medium required when the resistance box is set out 12 inches from the wall and supported on brackets? If the latter, would it be necessary to require the filling when the slab is mounted directly against a fireproof masonry wall, where, of course, the use of the slab would not be compulsory?**

Answer 1 (D). The filling of the countersunk holes in slate or marble slabs is for the purpose of preventing corrosion from moisture which will condense on the back, thereby affording the liability of short-circuits or grounds. The depth to which the hole is countersunk and the clearance afforded screws and bolts gives the necessary insulation, not considering the slight insulating qualities resulting from the filling compounds.

Answer 2 (P). The purpose of filling countersunk holes on the back of these slabs is to provide insulation against electricity. The material employed is in no sense a heat insulator, as it melts at a comparatively low temperature. When the slab is set out from the wall the air gap and the leakage distance across the surface of the slate furnish ample insulation, but where the slab is attached directly to combustible material, such as a wooden partition, nails and other metallic objects might come very close to the bolts, and the requirement of a filler is a wise precaution.

Answer 3 (B). An interpretation of rules is sometimes very difficult, in so far as attaining satisfactory results is concerned. It therefore should be evident that to attempt to explain why certain specifications are put into the rules is even more difficult. As regards the specific question as to the purpose of the filling applied to countersunk boltheads on the back of marble or slate slabs supporting resistance boxes, called for by Rule 4*a*, I would say that it would appear as if the object might properly be to exclude moisture or foreign matter from lodging in the countersunk holes, thereby possibly bridging the heads of the screws over to the grounded surface.

Answer 4 (I). The filling applied to cover bolt heads on a slab of the kind referred to is put there to provide an electric insulator. When the resistance is installed on iron brackets 12 inches from the wall there is but little danger of wires or other live parts being moved around in such a way that a short-circuit could be established by bringing them into contact with a bare bolthead; and hence the insulation is generally unnecessary.

Answer 5 (Y). Filler would be required in both cases. The filler is intended for protection from moisture, as well as an insulator, and a binder for the screws.

Answer 6 (C). The filling compound is required as an insulator, and to prevent corrosion in case there should be moisture present; also to withstand heat. (See Rule 65*d*.)

Answer 7 (O). The filling of countersunk bolt heads is for the purpose of securing a mechanical and permanent construction and insuring a separation of the bolts (which are in contact with rheostat frame) from the combustible material upon which the slate is mounted. The slate slab is for heat-insulating purposes, but, incidentally, is valuable in separating the rheostat frame from a damp or conducting surface in case the frame should come into electrical contact with the circuit. Regarding the second portion of this question, the filling behind bolt heads could hardly be insisted upon where the slab is not required.

Answer 8 (F). This filling serves several purposes; it holds the bolt rigidly in position, preventing it from turning, and also serves as a partial heat insulation. Of course, in the case of a fireproof wall this additional heat insulation is not necessary.

Answer 9 (E). I have felt that the filling of the countersunk bolt heads was intended more as an insulation against heat and to assure the countersinking of the bolt heads. It would be difficult to apply a rule, in one instance and to rescind the rule in another instance. This would lead to confusion. I think it best not to question or divide the application of this rule.

Answer 10 (U). I think this filling is meant to prevent the screw or bolt head from coming in contact with wood or other inflammable material. When the slab is placed against a brick wall, the requirement as to the filling might be waived.

Answer 11 (S). The slate, marble or soapstone is used to prevent the woodwork or other combustible material from being overheated. The filling which is required on the supporting boltheads is for the same purpose. As to the last part of the question, I should say No, as the slab is not required, the filling on the back is not necessary if a slab is used.

Answer 12 (M). The only use which I can see for the filling is to prevent turning and loosening of bolts.

Answer 13 (N). The purposes of the filler are many. It prevents the possible bridging of the gap by moisture, metallic substances driven against the back from hitting the screw head, bugs from nesting in against the metal, etc.

### Chicago Contractors Register.

The ordinance requiring electrical contractors in Chicago to be registered with the city department of electrical inspection has gone into effect, and the contractors began this week to take out certificates of registration. The initial fee is $25, with a renewal charge of $10 at the expiration of each year. The law requires that the person who supervises electrical construction, whether it be the contractor or his foreman, must have had four years' experience.

# Public Service Commissions

## CALIFORNIA.

The Railroad Commission issued a supplemental order authorizing the San Diego Consolidated Gas & Electric Company to issue $33,000 of its five-per-cent bonds at not less than 85.

A decision was rendered permitting the Southern California Edison Company to pledge its five-per-cent bonds of the value of $400,000 for the purpose of making extensions to its system.

## INDIANA.

The Public Service Commission has authorized the absorption of the People's Light & Heat Company, of Indianapolis, by the Merchants Heat & Light Company. The former is authorized to sell all its property and rights and the latter is authorized to purchase them for the sum of $525,000. The purchaser is authorized to issue new stock to the amount of $250,000 and five-per-cent bonds to the amount of $325,000, the latter to be sold for not less than 80 and the stock for not less than par. It is stipulated in the order of the Commission that the Merchants Company shall surrender its franchise rights and accept an indeterminate permit and that it shall continue to pay a tax of five per cent upon its gross receipts so long as its competitor, the Indianapolis Light & Heat Company, is legally required to pay a similar tax. It is also expressly stated that in any subsequent valuation of the company's property for rate-making purposes the value of any duplicated parts shall not be considered nor shall any of the securities now outstanding or authorized at this time by the Commission be deemed to have been capitalized against the public by these proceedings. The Commission fixed $100 per share as the value to be paid by the Merchants Company to the Indiana Trust Company for certain shares of stock held by the latter company as trustee.

## MASSACHUSETTS.

The Massachusetts Public Service Commission has ordered the Bay State Street Railway to make extensive repairs to its line on Mystic Street, Arlington.

## OKLAHOMA.

The Pioneer Telephone & Telegraph Company has notified the Corporation Commission of its intention to comply with the order for physical connections with the Grant County Rural Telephone Company, in accordance with the recent decision of the state Supreme Court, affirming finally the order of the Commission. The company at first contemplated taking this case to the United States Supreme Court on the ground of confiscation.

## WISCONSIN.

The Citizens Telephone Company of Eau Claire has received authority from the Wisconsin Railroad Commission to issue $3,500 of stock for the purpose of acquiring the existing property of the Chippewa County Telephone Company, Limited. That part of the application which prayed for authority to issue stock for the purpose of establishing a local telephone exchange in the city of Eau Claire for rendering local service within the city was denied. It appears that the Chippewa County Telephone Company maintained an exchange in the city of Eau Claire to serve primarily as a terminal for the Tri-State company's toll lines and incidentally as a local exchange for a very limited number of subscribers. The issues of securities were applied for to enable the petitioner to purchase the existing property and to make such extensions and improvements as would be necessary for the furnishing of local telephone service. The Wisconsin Telephone Company, which now owns and operates a local exchange in Eau Claire filed an objection to the issue of securities insofar as it applied to the construction of an exchange for the furnishing of local service, on the ground that the Chippewa County Telephone Company was not engaged in rendering local service and therefore its proposed grantee, The Citizens Telephone Company, can have no greater right. This view was held by the Commission, on the ground that the existing exchange is not furnishing local service, although it has a limited number of subscribers within the city. Under the Wisconsin statutes, a declaration from the Commission is necessary, stating that public convenience and necessity requires the existence of a second local telephone exchange before such an exchange can do business. A certificate has not been applied for and consequently an issue of stock for such purpose could not be authorized.

The Commission has handed down its decision on the application of the city of Milwaukee for a reduction in the rates of the Milwaukee Gas Light Company. The schedule ordered will effect a slight reduction for certain consumers. The present value of the property was found to be $8,770,148 and the cost of reproduction, $9,841,986. No objection was raised to the Commission's valuation of the physical property. The main portion of the testimony concerned the allowances for overhead, going value, working capital, paving and for unusual economies effected by the company during the growth of the plant. Several expert witnesses testified for the company to the effect that the Commission's allowance of 15 per cent to cover engineering, superintendence, interest during construction, contingencies, etc., was not great enough. The decision held that an allowance of 15 per cent was amply sufficient, and called attention to the fact that many of the items contained in the more liberal allowances claimed by the witnesses were in fact included in the unit costs used by the Commission in its appraisal. Working capital was allowed for to the extent of from $150,000 to $200,000 in addition to the value of stores and supplies aggregating $350,000. No allowance was made for going value, although several witnesses sought to show by various methods of calculation that from $2,000,000 to $3,000,000 would be a proper amount to allow for this purpose. It was pointed out that, although some weight might be given this claim for purposes of sale, the past business of the company has been such as to wipe out any deficit that might have occurred in building up the business. No allowance was made for paving except such as was actually incurred by reason of disturbed pavement. The total valuation used by the Commission as the basis for rates was $10,700,000. This total was arrived at by giving due weight to the matters of free house piping and to the economies resulting from the introduction of the booster system in lieu of the system of low-pressure mains and characterized by the Commission as "unusual engineering foresight," in its comments upon the matter.

## MODERN ILLUMINATION FOR INDUSTRIAL PLANTS.

By Harry C. Spillman.

The illumination of industrial plants has made rapid strides during the last five years. The old idea of placing lights at random without a reflector and only utilizing a small percentage of the total rays from the lamps has given way to a scientific study covering the kind of lamps, the most efficient shades, best mounting heights and numerous other features which have a direct bearing on the requirements which are demanded for the spaces to be lighted.

For general factory work the Mazda lamps give the best results, as these lamps need no attention, and the life of each lamp averages 1,200 hours. The first installation cost will compare favorably with other forms of artificial illumination; the current consumption is very low, and the lamps give a pure white light. In fact this form of illumination comes very close to daylight. In choosing this kind of illumination one of the first questions the engineer is called upon to decide is the correct size of lamp. It is best to adopt a standard size for the entire installation whenever possible, as the owner is only required to carry one size in stock instead of three or four, and it also eliminates the possibility of using a wrong size lamp in the reflector.

The wiring should be carefully laid out in order that each lamp will have the same voltage, as the life and intensity of light from a lamp depends upon the voltage. If the space to be illuminated is a large area having high ceilings, such as foundries or erecting shops, the large size lamp consuming 250 to 500 watts gives excellent results. If the rooms have rather low ceilings, about 12 feet in height, a smaller size unit will prove the best.

The next question to decide is the placing of the lamps and the engineer has the choice between single units or clusters of three or four lamps. The former scheme generally works out the best as it allows almost equal distribution of light at all points of the working plane, while with a cluster the plane is lighted in spots. The individual unit is more flexible as it allows one lamp to be changed without disturbing the general illuminating effect. The cost of installation for individual lamps over clusters runs about fifteen per cent higher, but its flexibility more than offsets this additional cost.

The type of reflector should have careful consideration as the efficiency of the lighting system depends largely on this item. For general factory work the shade should cover the greater portion of the lamp in order that the workmen's eyes be protected from the direct rays of the lamps. A metal shade having a white porcelain interior gives good results for industrial lighting. This form of shade is very rugged and will withstand the rough usage of a factory. It can be easily cleaned and is inexpensive. There are very few shades upon the market which are designed under scientific principles. The engineer, when purchasing shades, should ask for the design and shape of reflectors, and for photometric curve sheets showing the general characteristics of the reflectors, such as candlepower at different angles, the total lumens between different angles and efficiency of the shades. Another point which the engineer should remember is that reflectors are made of the focusing type which concentrates all the rays of the lamp into a small area, the intensive type confining the rays within an angle of 30 degrees on each side of the center of the shade, and the extensive type which confines the rays within an angle of 45 degrees. The best type to use depends entirely upon conditions, but for general illumination the extensive type is used and the focusing type is seldom used.

The mounting height of reflectors depends somewhat upon the height of the ceiling. It is best to keep the bottom of the reflectors at least 8 feet 6 inches from the floor. This will give a clear space for general floor work in a plant. It is well to remember that the intensity of light varies with the square of the distance, which causes the lamp and reflector mounted 20 feet from the working plane to only give one-fourth as much light as one mounted ten feet. The spacing of the lamps should have very careful consideration, as careful planning at the beginning will save making changes and alterations after the work is installed.

The intensity of the light desired at the working plane can be obtained by referring to the numerous tables prepared by reflector and lamp manufacturers. These tables also give the amount of light necessary for all kinds of work and under different conditions. If the engineer will keep these points in view he will have a system which will prove very efficient and will save the owners considerable trouble and expense when the installation is in use.

As a typical installation the new Detroit plant of the Continental Motor Manufacturing Company will be used as an example. This installation has been in operation over a year and the location of the lamps has not been changed. This was entirely due to the careful planning and foresight in order

General Illumination of Continental Motor Manufacturing Company's Plant.

Illumination of Offices—Continental Motor Manufacturing Company's Plant.

to bring about the desired results. 100-watt lamps were adopted as a standard throughout the factory, burning at their middle voltage. A standard mounting height of 9 feet 6 inches from the floor was adopted and the working planes 30 inches from the floor. This makes seven feet distance from the bottom of the reflector to the working plane.

When the prices were asked for on reflectors each proposal contained the guaranteed foot-candles at the working plane with lamps installed under these conditions, and spaced on 10-foot centers. Careful tabulation of these bids showed that the efficiency of standard makes varied only a small percentage. Holophane D'Olier porcelain enameled steel reflectors with enameled green exteriors were adopted. These reflectors were designed for the extensive type distribution and for 100-watt lamps. Bryan-Marsh Mazda lamps were used in connection with these shades.

The illumination of the stockrooms was planned to have the general illumination of sufficient intensity to do away with dark corners and take care of inspection, checking material and clerical work without extension lamps or individual lamps at desks. With this end in view the trucking aisles and storage spaces have the lamps placed on 10-foot centers and between each row of bins three lamps are installed each controlled by a pendant switch.

The assembly floor called for an illumination so that the men can assemble motors on a small portable stand, and in any part of the room, and also fit and assemble parts on the work benches which are placed against the side walls. The bench illumination was taken care of by placing 100-watt lamps on 10-foot centers so that the light is directly over the edge of the benches. This gives a strong light directly over the work without strong shadows. The remainder of the assembly floor has the lamps placed on nine-foot centers which give a very even light of sufficient strength for assembling motors.

The tool room demands the best kind of illumination as the tool makers are called upon to do very accurate work, and poor light in this department would cause the workmen to make serious mistakes. The illumination of this department was planned to avoid using extension lamps or individual lighting at the machines and with this end in view the outlets were placed with reference to the location of the machines, having the light in most cases directly over the work. On the milling machines a light was placed at each end of the table. A light located directly over each corner of the planer bed allowed the operator to work at any point without shadows. The shapers have a light on each side and the large grinders a lamp at each end. The lathes have a lamp located at each end, lathes with long beds have an additional lamp in the center. A light placed directly over each emery stand gives excellent light for grinding. The lamps are all mounted 9 feet 6 inches from the floor. The tool room has been in operation nearly a year and the workmen have not requested a single lamp changed. This lighting scheme does not require the use of extension lamps located on or near the machines.

The office depends entirely on general illumination from lamps placed on nine-foot centers at the standard mounting heights. No provision is made for desk lamps as the intensity of light is sufficient for general office work.

Tests have shown that the average intensity of light is five and one-quarter foot candles at the working plane. The cost of renewals has been very low.

Illumination of Assembly Floor—Continental Motor Manufacturing Company.

Illumination of Tool Room—Continental Motor Manufacturing Company.

## Boston Edison Improvements.

The Boston Electric Illuminating Company of Boston is undergoing a large expansion of its plant. At the present time five substations are in process of construction, while the great service station on Massachusetts Avenue is nearing completion.

A new structure, known as Station 13, has been erected in Roslindale, a residential district of Boston, to serve the West Roxbury district and Hyde Park. The building is of two stories, 67.5 by 113 feet, and is of fireproof construction, the lower story being of concrete and the upper of brick with cement stucco finish. The floors and roofs are of concrete, and the sash and trim are of metal.

The present equipment consists of transformers of a total capacity of 1500 kilowatts and 12 rectifiers for street lighting, capable of supplying 900 magnetite lamps. The equipment will ultimately be increased at least 100 per cent.

Another substation, designated as Substation No. 34, is being erected in the historic town of Lexington, 10 miles northwest of Boston, to serve this new territory, which includes also the towns of Bedford and Carlisle. The Edison Company recently entered this territory, purchasing the small local plant which served Lexington, and later extended its lines into the two towns mentioned, where the company furnishes street lighting, and commercial and residental service. It also furnishes energy to the Middlesex & Boston Street Railway Company as an auxiliary to that company's generating station at North Lexington. The new Edison station is being erected on Massachusetts Avenue, the main street of the town, a short distance from the town hall.

The building is to be of attractive design, as befits the surroundings, 67.5 by 111.5 feet, of high class fire-proof construction. The basement is to be of con-

crete, and the superstructure of brick with cement stucco finish. Like the Roslindale station, the floors and roof are to be of concrete, and the sash and trim of metal.

The building will contain apparatus for transforming high-tension current from the main generating station in South Boston to voltages suitable for local distribution. There will also be the appropriate switching and control apparatus, both for commercial, street-lighting and electric-railway service. Trunk line connections will be made with the Waltham and Woburn stations, to insure continuity of service.

The immediate equipment will consist of a transformer of 750 kilowatts capacity, rotaries for railway service of a total capacity of 1,500 kilowatts, and equipment to supply 100 street lamps. Ultimately the equipment will be increased to transformers with 3,000 kilowatts capacity, rotaries of the total capacity of 3,000 kilowatts, and equipment to supply 375 street lamps.

On completion of the permanent station, a small temporary station now standing on the front of the lot will be removed.

A new station, No. 14, is being erected on Beacon Street, Chelsea, about four miles north of Boston, to serve the district now being served by a station which will be abandoned. This new building is 99.5 by 52 feet, of one-story with mezzanine galleries all around, making practically a two-story structure, with basement. The material used and the architecture are similar to those of the Lexington station. The present equipment will be 1,500 kilowatts in transformers and apparatus to supply 400 street lamps. Eventually the transformers will be increased to 3,000 kilowatts and equipment provided for 600 street lamps.

Another substation in process of construction is No. 24, at South Framingham, a brick fireproof structure with concrete foundations and floors, of two stories, 50 by 134 feet. This station will serve the town of Framingham, now served from a station at Natick, and is built to provide for the rapidly developing business of the company in this district. Transformers of 2,100 kilowatts and equipment for 150 street lamps are to be installed at once, but provision is made for an increase to 3,900 kilowatts and equipment for 600 street lamps.

The largest of the Edison Company's new structures since the Massachusetts-Avenue service station is the six-story building, just started, on the site of the Boston & Providence railroad terminal in Boston. This will be of brick with ornamental front, steel frame, concrete floors, and thoroughly fire-proof. The basement will contain the heating and ventilating apparatus and elevator machinery. The first floor will contain motor-generators, etc., for transforming high-tension alternating current from the main station to low-tension direct current for distribution to customers. The second floor will contain the switching and control apparatus; also mercury-arc rectifiers providing direct current for street lamps. On the third floor will be storage batteries to insure continuity of service in case of accident to the regular apparatus. The fourth floor will be devoted to additional batteries in the future. The fifth and sixth floors are designed for the general business of the company, or may be let. The present installation will consist of two 1,000-kilowatt motor-generators and a battery of about 1,200 kilowatts. Ultimately there will be 10,000-kilowatt motor generators, four batteries and eight rectifiers for 600 magnetite arc lamps. The station is designed to serve the adjacent district of the Back Bay and South End, relieving the Head Place, Scotia Street and West Canton Street Stations.

## SOME INTERESTING INSTALLATIONS OF INDIRECT LIGHTING.

By Leonard V. James.

There has been no more encouraging development in the field of illumination for several years than is now at hand in the increasing interest being displayed by the general public in this important matter. While many are still content to use brilliant light sources, left entirely exposed or at best fitted or screened with improper shades which greatly reduce their efficiency, the efforts of societies, consulting engineers and manufacturers are beginning to bear fruit and there is an ever increasing demand for scientific illumination. The result is a very healthy activity all along the line, so far as manufacturers and salesmen of scientifically designed apparatus are concerned, together with an awakening on the part of the jobbers and contractors to the fact that they must be prepared to handle and explain high efficiency apparatus. The best thing about the movement is that it is not a "fad" but is a sincere desire for more comfortable and satisfactory illumination.

Manufacturers of fixtures using the indirect system of lighting have profited greatly by this movement. Because of the numerous new fixtures which are appearing on the market it is well to define indirect lighting as used in this article. It is here intended to mean that system in which none of the useful rays pass directly from the light source to the work or object illuminated, or rather in which all of the useful light flux comes from an enlarged source of low intensity on the ceiling, the rays having been directed

Fig. 1.—Effective Dining-Room Illumination with Luminous-Bowl Fixtures.

Fig. 2.—Bedroom Illumination with Decorated Luminous Bowl, Single-Unit Type.

Fig. 3.—Porch Lighting with Indirect Unit.

Fig. 5.—General Offices, Butler Brothers, Chicago.

there by means of opaque, scientifically designed pure silver plated glass reflectors within the bowl of the fixture. The result is a soft, uniform, diffused light with the elimination of all glare and harsh shadows.

While the luminous-bowl fixture as developed for and used in this system has been considered to some extent in other articles, in its present form it is a very new product and merits brief mention. The two extremes in modern fixtures are those in which no effort is made to subdue the light or to prevent the direct ray from striking upon the object as in direct lighting, and those using the indirect fixture before described. As a modified form of direct lighting, there is the "semi-indirect" system, so called because a part of the light is reflected to the ceiling, as in indirect, although more passes through the translucent bowl directly so that the result is really subdued or modified direct lighting. The luminous-bowl system is a modified form of indirect illumination in which all of the useful rays are reflected to and from the ceiling, the translucent bowl enclosing these opaque reflectors being itself illuminated to an intensity not exceeding that of the ceiling, by means of an added small lamp or an opal diffuser in the bottom of the reflector. In either case not more than ten per cent of the total light flux from the fixture is used in thus illuminating the bowl.

Fig. 4.—Control Board, One Hundred and Eighty-seventh Street Substation, New York City.

The luminous-bowl type is well adapted for residence lighting, the faint glow giving a charm which is an improvement even upon ordinary indirect lighting with opaque bowls. An installation in the living rooms of an Illinois residence is shown in Fig. 1 and in a bedroom in Fig. 2.

The possibilities in the use of this fixture as part of the decoration of a room are practically unlimited. Beautiful effects may be obtained by using colored bulbs for lighting the bowl or the glass of the bowl may itself be colored or decorated, as in Fig. 2.

The indirect system has entered new fields with its standard illumination. An interesting example of this is the porch lamp shown in Fig. 3, where the soft diffused light from a concealed source,

Fig. 6.—Indirect Lighting in a Law Office.

Fig. 7.—General Offices, Armour & Company, Chicago.

apparently a hanging basket, adds materially to the general tone of comfort and refinement. When people realize that the cost of operating such an installation is little if any more than in the case of direct lighting, giving anything like the same illumination in quality or general usefulness, the demand for indirect fixtures will greatly increase.

Another novel installation of this system shown in Fig. 4, is that in the 187th street substation of the New York Edison Company, New York City. In no place is it more necessary to provide adequate, proper illumination than at the switchboard in the power plant, particularly if high potentials are switched directly or even appear at any part of the board. The data in the case of the control balcony shown, are particularly interesting. In spite of the fact that the board is slate, the watts per square foot for illumination are only 1.72, each fixture containing a 150-watt Mazda lamp. The absence of glare on the meter dials and the excellent diffusion on the board, both front and rear, with the elimination of sharp shadows, makes this installation a particularly satisfactory one, both to the operators and to the Company.

Fig. 8.—An Example of Lighting with Floor Standards.

Among the new installations under more or less standard conditions, should be mentioned those in Butler Brothers' warehouse and wholesale offices and in the new home of the Armour Company, both in Chicago. (See Figs. 5, 6 and 7). These firms are credited with being the largest houses of their kind in the world. In each case, indirect illumination was decided upon after complete, exhaustive tests.

Figure 5 shows the general office at Butler Brothers and Fig. 6 a legal library in the Armour building. Figure 7 gives a view of the general offices on the main floor of the Armour building, in which 25,500 square feet of floor space is lighted by means of 288 100-watt fixtures, (1.13 watts per square foot.) Similar figures apply to the other installations. The photographs were taken in the evening and show accurately the quality and diffusion of the light. It is found that the cost for operating these installations compares very favorably with any other that might have been installed. The elimination of the necessity for desk lamps is in itself a great saving and advantage.

A unique adaptation of the indirect system is the Curtis portable, which combines the features of indirect illumination with an artistic dome and stand. The accompanying illustration shows an installation of the Curtis portable in the tea room of the Hyde Park Hotel, Chicago. This design has also been adapted for table lamps and piano lamps, and has become very popular for the artistic decoration of pretentious interiors.

## Fessenden Verdict Reversed.

A verdict of $406,175 for Reginald A. Fessenden by a jury in the United States District Court for damages through a breach of contract, against the National Electric Signaling Company and others, has been reversed in an opinion of the United States Circuit Court of Appeals. Judges Brown and Hale concur in the decision and Judge Aldrich dissents.

## SCHOOL ILLUMINATION.

### Illuminating Engineering Society Holds Joint Sessions with International Congress on School Hygiene.

Prominent in the discussions at the Fourth International Congress on School Hygiene, held at Buffalo, N. Y., August 25 to 30, was a consideration of the eyesight of the school children and the provision of proper illumination for their work. Special attention was given to the medical examination of children to discover abnormalities in their vision, and remarkable changes in the interest and in the work of the pupils was demonstrated when those having defective vision were fitted with glasses so that they could see properly.

Two sessions of the congress were devoted to school illumination, a symposium on this subject having been arranged by a committee of the Illuminating Engineering Society, of which Herbert E. Ives was president and W. R. Huntley, vice-president. The other members of this committee were E. L. Elliott, B. B. Hatch, M. Luckiesh, G. H. Stickney and Francis H. Gilpin. These sessions were held on the afternoon of August 29 and the morning of August 30.

A very interesting exhibition was held at the Broadway Auditorium. Among the exhibits was one arranged by the committee of the Illuminating Engineering Society illustrating glare from the reflecting surfaces of paper and blackboards, and indicating how it could be eliminated. The congress was attended by about 1,400 delegates from all parts of the world. The president was Charles W. Eliot, president emeritus of Harvard University.

The first of the sessions on school illumination was held on Friday afternoon in the City Hall, with Herbert E. Ives in the chair. Dr. Ives opened the session by calling attention to the object of the meeting and the general interest of the subject. He then gave a talk on the Illumination Primer of the Illuminating Engineering Society, entitled "Light: Its Use and Misuse," and illustrated the important features with lantern slides. During this presentation the chair was occupied by George H. Stickney.

The first paper to be presented was one entitled "The Relation of Illumination to Ocular Hygiene," by E. M. Alger, M. D. In the absence of the author this was presented by Wendell Reber.

This paper pointed out the dependence of sharp vision, as well as comfort and fatigue, upon illumination. Overlighting may be more detrimental than underlighting. He referred to the large range of retinal adaptation, and pointed out that blindness may result from direct sunlight and that retinal images are retained after looking at any dazzling source of

light. Some persons have a blunted retina from such exposures and need a more intense light to see by than does the normal person. The apparent brightness of an object depends upon its surroundings. School children should not be made to face windows or have light reflected into their eyes by polished surfaces. A flickering light is painful because there is a continual effort to adjust the eye. Shadows are necessary but should not be too intense. Hence a single small source of light is objectionable. He stated it to be the opinion of many oculists that a cataract of the eye may be produced by undue exposure to ultra-violet rays. While visual acuity may be greater with monochromatic light, daylight is preferable for comfort, endurance and maintained efficiency, and it is the ideal light. Our eyes have been adapted to it by generations of use. North light is preferable for a number of reasons, but it cannot always be had and it is desirable to make artificial lighting similar to it. Since the latter is more manageable, it will largely displace daylight in schools and factories when we are able to make it a perfect substitute for daylight.

In discussing this paper J. W. Scheschewsky referred to the use of amber glasses, which is advocated by some, and stated that this produced the result that the retinal pigment is not properly fed to the retinal surface. When the illumination is too intense it is preferable to cut off a portion of the light at both ends of the spectrum.

Dr. Reber also objected to colored glasses of the kind mentioned and spoke in favor of "Umbro" glasses, which cut down the intensity of all parts of the spectrum.

Dr. Lewis pointed out that a lessened ability to see carries with it a lessened ability to think.

The next paper was one entitled "The Efficiency of the Eye Under Different Systems of Lighting," by C. A. Ferree, professor of psychology, Bryn Mawr College.

### The Efficiency of the Eye Under Different Systems of Lighting.

Confronting the problem of the effect of lighting systems on the eye, it is obvious that the first step towards systematic work is to obtain some means of making a definite estimate of this effect. The prominent effects of bad lighting systems are loss of efficiency, temporary and progressive, and eye discomfort. Three classes of effect may be investigated: (1) the effect on the general level or scale of efficiency for the fresh eye; (2) loss of efficiency as the result of a period of work; and (3) the tendency to produce discomfort. Of these three classes of effect the last two are obviously the more important, for the best lighting system is not the one that gives us the maximum acuity of vision for the momentary judgment or the highest level of efficiency for the fresh eye. It is rather the one that gives us the least loss of efficiency for a period of work, and the maximum of comfort. The author has carried out tests to consider (2) and (3) but only the results in (2) are reported in this paper. The method used is that described

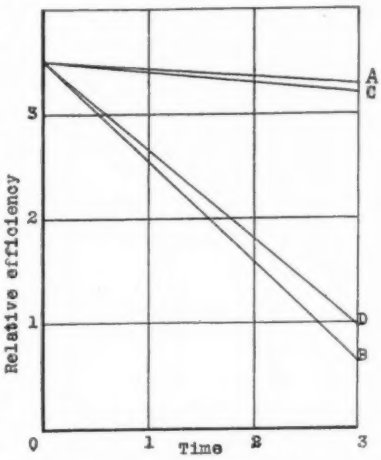



Fig. 1.—Decrease of Efficiency With Time for Two Foot-Candles.

by the author in another paper presented before the Illuminating Engineering Society in September, 1912 (See ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, September 28, 1912).

There are three aspects of light concerned with efficiency and comfort: (1) distribution in the field; (2) intensity; (3) quality. Four types of illumination giving different distributions were tested: (A) daylight, (B) direct artificial lighting, (C) indirect, (D) semi-indirect. Of these (A) gives the best diffusion, while (B) is at the other extreme, producing bright images of the source of light on the border of the retina. (C) is the best artificial approximation to daylight yet devised. (D) is a compromise between (B) and (C), but tests show that the apparent concession to the welfare of the eye is not as great as supposed. Tests were carried out with electric lamps arranged at the same height from the ceiling for (B), (C) and (D). For direct lighting either 8 or 16 clear-bulb tungsten lamps were used. For (C) reflectors made by the National X-Ray Reflector Company were used. For (D) hemispheres of alba glass, open at the top, were used.

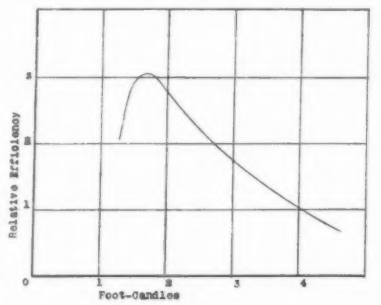



Fig. 2.—Efficiency After Three Hours for a Semi-Indirect Installation.

TABLE I.—SEMI-INDIRECT SYSTEM WITH EIGHT TUNGSTEN LAMPS.

| Watts | Foot Candles Horiz. | 45° | Ver. | Relative Efficiency |
|---|---|---|---|---|
| 320 | 1.79 | 1.2 | 0.46 | 3.00 |
| 200 | 1.40 | 1.05 | 0.39 | 2.78 |
| 200 | 1.28 | 0.95 | 0.37 | 2.07 |
| 480 | 3.01 | 2.07 | 0.81 | 1.75 |
| 800 | 4.42 | 3.02 | 1.32 | 0.79 |

TABLE II.—DIRECT SYSTEM WITH EIGHT CLEAR-BULB TUNGSTEN LAMPS.

| Watts | Foot Candles Horiz. | 45° | Ver. | Relative Efficiency |
|---|---|---|---|---|
| 200 | 1.00 | 0.79 | 0.34 | 2.3 |
| 120 | 0.41 | 0.31 | 0.14 | 1.9 |
| 320 | 1.24 | 0.87 | 0.39 | 1.61 |
| 480 | 2.06 | 1.42 | 0.68 | 1.15 |

The loss of efficiency of the eye after three hours of work under systems (B) and (D) was far greater than with daylight, whereas for (C) it was only slight. This is shown in Fig. (1), in which the ordinates represent the measure of efficiency of the eye. These results were obtained with an intensity of about two foot-candles. Acuity tests give the same order of merit—A, C, D, B. Thus both acuity and retention of efficiency are greatest under the system giving the best distribution of light. The author considers the loss of efficiency to be a muscular effect. While distribution is not the only thing to consider, the author regarded it as most important. Intensity and quality are also important, but tests of quality have not yet been made. Results have been obtained, however, for different intensities, which show that a wide range is permissible for both daylight and indirect artificial lighting. For semi-indirect the best result was obtained at 1.7 foot-candles, with a falling off for both higher and lower values. For direct lighting, no intensity was found at which the efficiency did not show a large decrease at the end of three hours.

Tables I and II show some results obtained with direct and semi-indirect lighting. The results for the latter are also shown in Fig. 2. At the maximum point of this curve, which occurs for 1.7 foot-candles in a horizontal plane and 0.4 in a vertical plane, this compares very well with the indirect system. At intensities much higher or lower than this value, however, the loss of efficiency is very great. Intensities such as are recommended in the Illumination Primer would correspond to a large loss in efficiency. Values giving little loss of efficiency are too low for the greatest acuity. Hence, high acuity and high maintenance of efficiency cannot be had at the same intensity with the direct and semi-indirect systems as used in these experiments. One or the other of these features must be sacrificed. The most favorable intensity found with direct lighting was for an intensity of 0.34 foot-candle on a vertical plane and 1.0 foot-candle horizontal.

The author concludes that of the lighting factors that influence the welfare of the eye, distribution is apparently fundamental. It seems to be the most important factor we have yet to deal with in our search for the conditions that give us the minimum loss of efficiency and the maximum comfort in seeing. If, for example, the light is well distributed in the field of vision and is diffuse, our tests seem to indicate that the eye, so far as the problem of lighting is concerned, is practically independent of intensity. That is, when the proper distribution is present, intensities high enough to give maximum discrimination of detail may be employed without causing appreciable damage or discomfort to the eye. For the kind of distribution given by the majority of lighting systems in use at the present time the results show that unquestionably too much light is being used for the welfare and comfort of the eye.

As to quality, no systematic study has yet been made. It is sometimes thought that colored light, and especially yellow light, is better for the eye, but there does not seem to be any warrant for this idea. The author has found carbon lamps, for instance, inferior to tungsten lamps which give a whiter light. If there be any advantage in the kerosene lamp, it is due to the lower intrinsic brilliancy and the position in which it is used. If the source is in the field of vision at all, it should be at the level of the eye.

In discussing this paper, Wendell Reber said, concerning the latter point, that in the eyes of all animals the pigment in the upper and lower halves of the retina is different.

Myles Standish, of Boston, said that too much weight should not be given to laboratory experiments. Many factors may enter to upset our present ideas. He (as an oculist) gets more complaints arising from indirect lighting than from semi-indirect.

James Kerr, of London, England, thought that loss of efficiency is not the only criterion to be considered for such work as threading needles. Fine work like this requires high illumination. An indirect system installed in the dissecting room at the University of Cambridge had to be removed and replaced by a direct system. With the same amount of light the latter gave better local illumination.

George H. Stickney thought conclusions should not be made too hastily. He had seen both good and poor installations with each system.

### Glare.

A paper was then presented by M. Luckiesh entitled "Glare From Paper."

Even though light sources may be placed out of the field of vision it is still possible to have glare reflection from polished surfaces. Glossy paper is the worst offender in this respect. While this source of glare has been recognized by some school authorities and the use of paper with a matt surface has been instituted by some publishers, the movement is not sufficiently general. A committee, of which Mr. Luckiesh is chairman, has been taking this matter up with school officials and publishers, but results with the former have not been very satisfactory. The publishers are giving more study to this problem and the principal obstacle to progress has been the claim that suitable paper, which is at the same time cheap and durable, could not be obtained. This objection is being rapidly removed and it appears possible to find a suitable paper for most cases. Glossy paper is now being used in many cases where there is no excuse for it.

In discussing this paper Wendell Reber said that the school committee in Pennsylvania had taken this matter up and agreed to use only books containing paper with a matt surface. There are other considerations to be involved in the choice of books, however, such as the size and kind of type, the color of the paper, etc. Many of these questions can only be settled by such tests as Dr. Ferree had described. As to color, he personally preferred a light amber. This committee is also arranging to have inserted in the front of each school book directions for reading properly.

The last paper of the session was "Influence of Blackboards' Position on Lighting of Desks," by Mathilde Gstettner, M. D., secretary of the Austrian School Hygiene Association.

This paper gave the results of measurements of the intensity of illumination upon the school desks when blackboards were in position and when they were removed. The great range of adjustment needed in the eye was pointed out, since sunlight may be as intense as 76,000 meter-candles, whereas not more than about 50 is necessary. Proper artificial lighting is difficult on account of the wall coverings and shadows caused by the pupils themselves. A white wall will usually give the highest co-efficient of reflection, but it is a question whether it is not too glaring for a wall surface. Blackboards interfere greatly with the reflection from the walls, especially in the United States, where wall space is so generally devoted to them. About 3,000 measurements had been made with an illuminometer placed upon the top of the desk under various systems of lighting, such as direct and indirect, daylight, electric and gas lamps, etc. In the Austrian schools there are usually two blank walls and in the university rooms, one. These measurements showed in general about 15 per cent difference in the illumination at the desk. The author concluded that whiteboards would be preferable to blackboards and that blackboards should only be used when the desks are supplied with sufficient light.

In discussing this paper, M. Luckiesh stated that it was difficult to prevent glare from blackboards and hence a very diffused light should be used. He had visited many schools and found that glare could not be avoided even with daylight. Blackboard surfaces should be as matt as possible, but they usually acquire a certain amount of glaze through use. One proposal for avoiding the glare was by tipping the blackboard at a slight angle, so that no direct reflection would reach the pupil's eye.

F. Park Lewis suggested drawing light shades over the blackboards when they are not in use for the purpose of increasing the general illumination. He referred to the trial of whiteboards made of vitrolite with a sand-blasted surface. No satisfactory crayon had yet been found for use with such a board, but he advocated experiments with whiteboards.

Dr. Gstettner stated that whiteboards had been used in Vienna with satisfaction, although the crayon used was one which had to be washed off with water.

James Kerr, of London, pointed out that the darkest desks, which are those farthest from the windows, are the ones which are nearest to the blackboards, so that the effect of the latter is greatest where it is most objectionable. He spoke of the use in England of ground glass placed over whiteboards. The only objection to this might be one of cost. Blackboards require 50 per cent more illumination than the rest of the room.

Attention was also called to the use of rolls of paper in place of blackboards, the paper being used but once, after the manner of the modern sanitary towels. This is not too expensive and in addition to avoiding the use of the blackboard, it is more sanitary, since chalk dust is not disseminated through the room.

### Saturday Session.

The final session was held on Saturday morning at 9 o'clock with Herbert E. Ives in the chair. The first paper presented was entitled "Reasons for Overhead Lighting in Schools," by D. W. Weaver, commissioner of health in Greensburg, Ind.

Indiana has a law that all daylight in school rooms shall fall over the left shoulder of the pupil. It is impossible to carry this out for all the children in a room when the lighting is from one side. The light in a school room should be diffused, steady, sufficient in intensity and low in actinic rays. Diffused daylight is the best. The author considered the objections arising when the light comes from any horizontal direction. Whether it be from the right, left, front or back, there will be shadows, glare or poor illumination for some persons in the room. Even when it is from the left

side of the room, some pupils in the rear will not get the light over their left shoulders. It is not possible to get north light in all rooms, and there is bound to be some glare when it comes from any other direction. He concluded that overhead lighting was the least objectionable, as it can be better diffused and the intensity made more nearly the same in all parts of the room. Skylights are, however, only applicable to one-story buildings. Here they are advisable and should be supplemented by prismatic glassware to diffuse the light to all parts of the room. Other rooms should have high windows also equipped with prismatic glassware. Where artificial lighting must be used it should be of the indirect type. He pointed out that industrial plants often use overhead skylights. Whether daylight or artificial light be used, it should be arranged so that no beams of light fall directly upon the eye.

G. H. Stickney opened the discussion, pointing out that a large component of vertical light is not pleasant. With the prismatic glass, however, the effect is entirely different and much more pleasant. He told of a studio where overhead lighting has produced much eye-strain and was replaced by a saw-tooth arrangement which was much more satisfactory. Schools should be planned with sufficient daylight for day needs, and artificial lighting should be planned for the night.

There was considerable discussion as to the type, material and color of window shades most desirable, and the following ideas were brought out. Shades should not interfere with ventilation; they should be translucent and of a light tint so as to constitute a light wall for night illumination; they should preferably permit of opening at either top or bottom; they should be white, according to Dr. Reber, although some others did not agree with him. He maintained that while light green or amber might be more pleasing and less fatiguing to certain individuals, white was preferable for a large body of persons such as school children. The amount of skylight should be proportioned to the floor space and depend also upon its location. Glazed surfaces produce less trouble with overhead lighting, but they are still important, and Mr. Luckiesh claimed that glare could not be gotten rid of by this means. E. B. Rowe said that desk tops should not have polished surfaces, but a dull finish. Holly, Mich., has a school building with overhead lighting and brown matt wallboards of composition material. Dr. Fitz favored Venetian blinds.

James Kerr, of the Department of Education, London, England, then presented his paper entitled "The Illumination of Class-Rooms."

He pointed out the great range of adaptation of the eye, which easily adjusts itself to intensities of daylight varying from 5 to 500 foot-candles. After ten minutes in the dark its sensitiveness is 25 times as great as in bright light. This adaptation gives some protection from glare, but it is not complete. He distinguished two kinds of glare, primary and secondary. Primary glare is illustrated by after-images and by a burnt-out retina, such as occurs from looking directly at the sun. Secondary glare is due to peripheral images which are bright in comparison with the object viewed. It is more easily set up in the lower half of the field of vision and nearer to the object. It was found among English school children that nearly one-third need a higher intensity than normal on account of deficient visual acuity. The above variations in the sensitiveness of the eye and the difference in individual requirements of different children must be considered in lighting problems. The author then told of measurements of illumination in school rooms. In one room 45 feet long there was a variation of intensity with daylight from 30 to 800 foot-candles, and the values may vary from minute to minute on a partly cloudy day. The minimum allowed should be 10 foot-candles. This can be determined by the angle of visible sky subtended at the desk. Where sufficient exposed sky is unavailable, the reflection from roofs and walls must be utilized. The lower floors in a building should have a greater height. Windows should be carried to the ceiling. The ceiling and upper walls should have a matt surface and be faintly tinted. Top lighting is desirable for one-story buildings. He then quoted the report of the committee of the London Illuminating Engineering Society upon artificial school lighting. This report set the minimum at two foot-candles for close work; one foot-candle for general lighting; and four foot-candles for special work. He spoke of the necessity of using suitable reflectors and shades. Indirect lighting is pleasing, but probably requires a higher intensity and he preferred the semi-indirect. Cost should be a minor consideration in planning school lighting. As between gas and electricity, he preferred electricity, for hygienic reasons, even though gas might be cheaper.

Dr. Lancaster, of Boston, said there was not yet any consensus of opinion as to the best way to light. This is because our ideas are founded upon mere impressions and also because we often consider one important point but neglect others.

Another speaker called attention to the fact that the height of windows and ceiling should be proportioned to the depth of the room. In illustration, he referred to a country school in Kansas which had been remodeled. The window area is 20 per cent of the floor area; there is a 14-foot ceiling for a room 32 feet deep.

Ward Harrison referred to the new building of the Cleveland Hardware Company, an industrial plant in Cleveland, O., which has placed its office on the top floor. This has a saw-tooth roof and prismatic glass. The chairs face south; the windows represent 20 per cent of the floor area and the light is diffused from the opposite side of the tooth. Ventilation is secured by opening these windows at a slight angle. Artificial lighting is arranged for a similar distribution, the lighting units being placed at the foot of the tooth, with diffusing reflectors. This installation is very satisfactory and could well be copied for schools.

Dr. Ives referred to the many special expedients which are adopted for special lighting, and there is consequently hope for satisfactory school lighting.

In closing the discussion, Dr. Kerr pointed out the difficulty of considering all the factors in the problem. Large experience is necessary. Glare is the worst thing to contend with. In England they do not have the same difficulties with window shades as there the aim is to get sunlight, not exclude it. Color has much to do with irritation, white being the least and red the most irritating.

The final paper of the session was by George Fitz and was entitled "The Practical Methods of Testing Light in School Rooms, with a Demonstration of the Photometer for Lighting Tests in School and Work Rooms."

Ten foot-candles is considered a minimum in the school-room, for the most remote desk on the darkest day. There are several methods of measuring or estimating intensity values. He pointed out the difficulties in using the most suitable instruments by trained observers at the time of the minimum. Readings taken at other times and corrected to obtain the minimum value may be in error by 50 per cent. Tests by reading selected type are also unsatisfactory. A fourth method frequently used is to measure the solid angle subtended by the visible sky and the minimum for this angle is fifty square degrees. The author has devised a simple instrument for roughly making this measurement. It consists of a watch glass with a dark background and a paper scale across its face. This is placed upon the desk and the size of each window as seen in it by reflection is read off upon the scale.

Dr. Kerr pointed out that the square degree of sky does not have the same value near the horizon as in the zenith and a correction should be made on this account. He described a simple method devised by himself for making this correction. Dr. Lancaster pointed out that accuracy is not necessary and a rough measurement is satisfactory.

## Portable Electric Mine Lamps.

The United States Bureau of Mines has recently issued a Technical Paper, 47, by H. H. Clark, entitled, "Portable Electric Mine Lamps." The paper states that the development and use of portable electric lamps for mines is just beginning in the United States and that the Bureau of Mines is interested in the subject because the Bureau believes that the safety of mining operations will be largely increased by the abandonment of flame lamps, except for gas testing, and the substitution of portable electric lamps. The locked safety lamp is the only portable lamp now used underground that is comparable as regards safety with a well constructed portable electric lamp. The author of the paper considers that the portable electric lamp is safer than the safety lamp.

To quote from the paper: "Even the locked type of safety lamp has its weak points. The omission or improper adjustment of some part may render the lamp unsafe and this condition may be effectually hidden from the user of the lamp and continue to exist until the lamp is opened and readjusted. The user has no means of detecting imperfect arrangement of lamp parts and must depend for safety upon the one whose duty it is to prepare the lamps for use. Reports indicate that safety lamps are not always properly adjusted in the lamp house.

"The filament of portable electric lamps is normally surrounded by a vacuum which as long as it exists absolutely prevents gas from coming in contract ith the filament. If the vacuum is destroyed, the fact becomes evident in a few seconds at most, because the filament becomes dim and soon ceases to glow. Thus there is inherent in the construction of the electric lamp an effectual safeguard whose disappearance is announced automatically, unmistakably, and without delay. Moreover, though the destruction of the vacuum may give rise to a condition of potential danger, the air that takes the place of the vacuum removes the condition in a short time by causing the filament to burn in two. Therefore, it is not only impossible for the user of a portable electric lamp to remain ignorant of its unsafe condition, but it is also impossible for the unsafe condition to endure for more than a fraction of a minute.

"Although an electric lamp cannot be regarded as a safety lamp, if the latter be defined as a lamp that detects the presence of gas without igniting it, still if the presence of gas is known a well constructed portable electric lamp, even without special safety devices, would seem to be quite as safe as a safety lamp because while either may possibly ignite gas as the result of an accident, an unbroken safety lamp may cause disaster if its parts are improperly arranged."

The paper reviews the possible sources of danger in portable electric lamps and declares that the glowing filament of the bulb is the only source of danger as far as the ignition of gas is concerned. The paper recites at some length the author's experiments as to the ignition of mine gas by such sparks and arcs as could be obtained from the batteries of portable electric lamps even when the latter were short-circuited. The results of these experiments show quite conclusively that a portable electric lamp equipmentwhose battery potential does not exceed six volts could not produce a spark sufficient to ignite mine gas.

Technical Paper 23 and Bulletin 52 of the Bureau of Mines show that certain sizes of miniature lamp bulbs are capable of igniting explosive mixtures of mine gas and air if the bulbs are broken so that their filaments are not injured. The author points out that if the bulb of a portable lamp is properly protected by its reflector and a stout outer glass, it would be a noteworthy exception if a blow that broke such a bulb failed to destroy its filament also; while noteworthy, it is however possible. The paper states, however, that not even that remote contingency need be feared if the mounting of the lamp bulb be so designed that a blow sufficient to break the bulb will at the same time short-circuit it or open the electric circuit of the lamp.

It is not yet certain whether the hand lamp or cap lamp will be more popular in this country. In Europe the hand lamp is used almost exclusively but the sentiment in the United States seems to favor the cap lamp, probably because there are so many open light mines in this country.

The author summarizes as follows the more important considerations in the designs of portable electric lamp equipment:

"After safety the next consideration is the production of a proper amount of light for approximately ten hours on the charge. The next is reliability of service, which is followed by lightness and durability. Convenience in handling and charging is an important characteristic. The outfit should not leak or spill electrolyte and it should not be necessary for the users to exercise care to prevent such leakage. In batteries that cannot be overcharged without injury, condition of charge is important in order that the batteries may not be continually overcharged and overdischarged to the detriment of the elements. Finally, it is desirable that a battery should hold its charge during long periods of idleness."

The paper concludes with the following paragraph: "The Bureau of Mines is at present engaged in an investigation of all the patterns of portable electric mine lamps that, as far as the Bureau is aware, are manufactured in the United States. All of the characteristics of each lamp equipment, as well as its safety for use in gaseous mines, are being considered. Any manufacturer of portable electric mine lamps may have his equipment included in this investigation by applying to the Director of the Bureau for permission to submit equipment for test. Upon receipt of such a request the Director will inform the applicant how many outfits and spare parts will be needed and where and to whom the equipment should be shipped."

## Washington Has High-Grade Coals.

The coals of Washington, while limited to six or seven somewhat scattered areas in the western half of the State, chiefly along the eastern border of Puget Sound, have a wide range in character—from anthracite to lignite. Lignites are found in the southwestern part of the State. The areas along Puget Sound contain sub-bituminous and bituminous coals, and in the northwestern part of the State, anthracite has been reported.

The coal-mining industry of Washington has suffered considerably during the last few years from the competition of fuel oil from California, the former principal consumers of Washington coal, the Puget Sound steamers and the railroads, having adopted petroleum for fuel. Even the railroads that have their own coal mines on their lines are using oil for locomotives, particularly through the forested areas, where the sparkless character of that fuel gives protection against fire. The cleanliness of the liquid fuel and its greater economy in labor give it a decided advantage over coal as a steam fuel on the Sound steamers.

The production of coal in Washington reached its maximum in 1910, when the output amounted to 3,911,899 short tons. It decreased to 3,360,932 tons in 1912.

## Idaho Copper Production.

The production of copper in Idaho, increased from 5,152,937 pounds; valued at $644,117, in 1911, to 7,492,152 pounds, valued at $1,236,205, in 1912.

## Electrochemical Meeting in Colorado.

The regular semi-annual meeting of the American Electrochemical Society will be held in Colorado next week, with sessions at Denver, Boulder and Golden. In addition to the papers mentioned in our last issue, the following have been placed upon the program: "The Electrolysis of Aqueous Solutions of the Simple Alkaline Cyanides," by G. H. Clevenger and M. L. Hall; "Some Observations on Base-Metal Thermocouples," by O. L. Kowalke; "Osmium-Platinum—A New Alloy," by F. Zimmermann; "The Electric Zinc Furnace," by Peter E. Peterson; "Solid Thick Deposits of Lead From Lead-Acetate Solutions," by Frank C. Mathers; "Progress in Electrostatic Ore Dressing," by Frank S. Macgregor.

Other features of the convention were mentioned last week.

## Nashville Jovians Organize.

Due to the enterprise and activity of Statesman Robert C. Leonard and Alternate Statesman James A. Cayce, Jr., of Nashville, the Jovians of that city met at luncheon at the Nashville Commercial Club on Monday, August 25. Past Jupiter Oscar C. Turner, of Birmingham, presided and speeches were made by the following Jovians: John P. Brown, superintendent of Nashville Railway and Light Company; J. P. Lawrence, of Herbrick-Lawrence Company; Statesman Leonard and Alternate Statesman Cayce, and Eleventh Mercury Ell C. Bennett, of St. Louis, Mo.

The theme of all the speeches was the advantage that would accrue to Nashville from the establishment of a permanent Jovian Luncheon Club. So well did the speakers point the merit of such a league that an organization was effected then and there.

J. P. Brown was elected president, J. P. Lawrence, secretary, and the next meeting set for Jovian Day, September 6.

H. H. Corson, local manager for the General Electric Company, was also present, together with a number of other prospective Jovians. Mr. Corson made a very interesting talk on the conditions in Nashville in the electrical industry and stated that he believed an organization such as The Jovian Order could be of practical benefit to the industry there. He stated his willingness not only to himself become a member but to suggest membership in the Order to some fifteen or twenty other members of his organization. Jovian Brown made a like statement as to the number of prospective candidates in his organization, all of which points to a very successful rejuvenation in Nashville in the near future.

## BOOK REVIEWS.

"Factory Lighting." By Clarence E. Clewell. New York: McGraw-Hill Book Company, Incorporated. Cloth, 161 pages (6x9 inches), 100 illustrations. Supplied by the Electrical Review Publishing Company for $2.00.

This book is distinctly a collection of data obtained by the author during his extensive engagement in the design of lighting systems covering a wide variety of industrial operations. The author has wisely refrained from excess in generalized statements, for the present state of the science of lighting does not warrant such procedure. He has therefore adopted the only feasible plan, which depends upon descriptions and analyses of actual installations to aid those interested in industrial lighting.

In the first chapter graphical charts are presened showing the candlepower ranges and physical dimensions of relatively old and new lamps. The two chapters following are devoted chiefly to illumination design and installation work, in which such factors as type, spacing, height and switch control of lamps are discussed. A chapter is also devoted to lighting maintenance and records, which are of highest importance yet very often neglected. Office lighting is discussed at considerable length and the author concludes that general lighting with small units is usually the most satisfactory. While the author recognizes the desirable features of indirect lighting, he finds it difficult in some cases of factory office lighting to keep the ceiling and inverted units clean without excessive maintenance charges. In drafting-room lighting the chief desire is to eliminate shadows. This demands very general lighting or diffused lighting such as results from inverted fixtures. Glare from tracing paper is also undesirable and is also eliminated by diffuse lighting. Several actual cases of drafting-room lighting are discussed.

Many other installations are described, which cover power houses, steel mills, machine-tool lighting and other factory operations. In these various cases success seems to be assured only when the lighting expert places himself in the position of the operator, adjusts the position of the light units and chooses the reflector with judgment born of experience.

Use is found for all modern electric illuminants, but the small lighting unit is conspicuously present owing to the fact that it so readily adapts itself to the demands of good lighting. Only where ceilings are very high do the candlepower units meet with favor. General lighting with the elimination of individual lamps or localized units as far as possible is one general principle in evidence throughout the book.

The author presents a modern picture of factory illumination which is in striking contrast with recollections of the prevailing conditions ten years ago and which vividly illustrates the wonderful growth of the science of lighting. However, in many factories the conditions of ten years ago are found unchanged. The application of the principles found in Mr. Clewell's book would in these cases decrease the cost of production besides affording greater comfort to the workman and a safeguard from accident.

M. LUCKIESH.

"Electric Arcs." By Clement D. Child. New York: D. Van Nostrand Company. Cloth, 194 pages (5¼x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.00.

Little is known concerning the laws governing the electric arc. This is acknowledged by the author in the following very appropriate statement: "Not only is there uncertainty concerning the laws but the explanations often raise more questions than they settle."

Of particular interest is Chapter IX, Theory of the Electric Arc, the author being especially well able to present the subject, being the first, or, at least, one of the first, to explain the phenomena of the electric arc by the ionic theory.

On page 67—subject, Magnetite Arc—the statement is made that magnetite is used for the electrode because it gives off a vapor which is very luminous in the arc. In reality magnetite is used because it is a material, the vapor of which serves as a source of good color spectrum; though not very efficient as a light producer, it is not affected by the air, is a good conductor and stable at all normal temperatures. Titanium oxide, $TiO_2$ (rutile), is used in the negative electrode to furnish luminosity to the arc stream.

The book should prove exceedingly valuable as a reference for more extended study of the electric arc, as in the various subjects taken up there has been no attempt to give an exhaustive treatise, but rather a general review, with an excellent list of references.

G. N. CHAMBERLIN.

"Electricity at High Pressures and Frequencies." By Henry L. Transtrom. Chicago: The Joseph G. Branch Publishing Company. Cloth, 248 pages (5¼ by 7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.00.

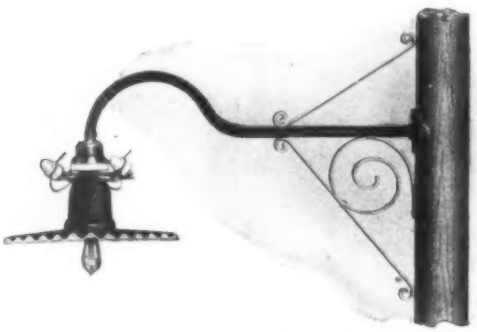
This book seeks to tell in simple, practical language the story of the phenomena discovered in the use of electricity at high pressures and frequencies. It is written especially for the practical man and eliminates to as great a degree as possible a deeply theoretical or mathematical treatment of the subject. In order that the manifestations of electricity at high pressures and frequencies may be better understood the fundamental principles of the generation and action of electricity are explained.

# New Electrical and Mechanical Appliances

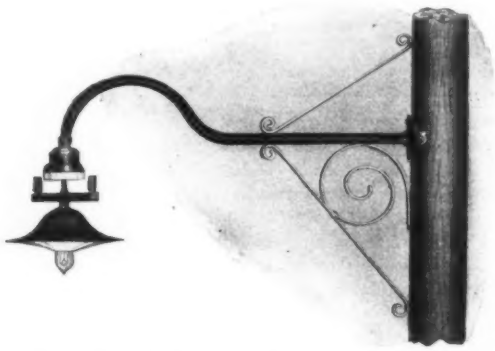
## New Kyle Line of Tungsten Fixtures.

The subject of street lighting has been given more than ordinary consideration during the past five years. Both the tungsten bracket fixture and the street post have come into extensive use in communities all over the country.

The Public Service Company, of Chicago, has designed a standard type of tungsten street fixture, two styles of which are shown in the accompanying illustrations. These fixtures, which are made by the Line Material Company, of South Milwaukee, Wis., are of substantial and attractive construction.



New Tungsten Fixture With Fluted Porcelain Reflector.



New Tungsten Fixture With Japanned Reflector.

A clover-leaf iron pole plate is provided for securing the fixture, which is large enough for any pole, and being made of malleable iron, can be shaped to small poles as well. Ornamental steel scrolls above and below the pipe add to the appearance and strength. To one end of the five-foot, one-inch-pipe gooseneck is attached one of the Kyle non-drop insulators, tested to 20,000 volts.

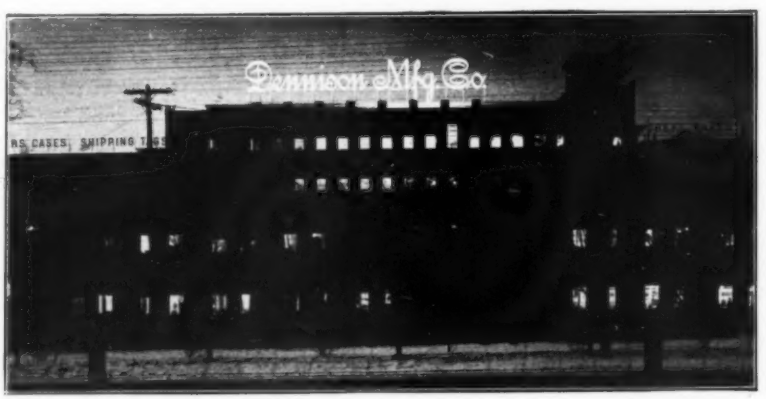
The two styles of fixture shown differ in that one has a japanned reflector (17 and 22-inch sizes) and the other a porcelain-enameled fluted reflector (18 and 20-inch sizes). Between the reflector and insulator there is a malleable-iron spreader arm, to which are attached two ordinary wood pins. Glass insulators can therefore be used for supporting the wires to the lamp, insuring good insulation.

In the case of the fixture with a fluted reflector, the spreader arm is part of the socket casing. This type of street fixture is furnished with the ordinary Edison-base socket or with a series-cutout socket.

## A Novel Advertising Sign.

If you should happen to be a passenger some evening on a train passing through the town of Framingham, Mass., you would very likely hear some fellow passenger call attention to the Dennison sign, and see several people on the opposite side of the car jump up to get a better view.

If later you were to question the passengers as to which of the electric signs seen from the train made the strongest impression on them, it is reasonably certain that the majority would say the Dennison sign. And the reason for the answer would lie in the fact that the sign is not only very readable but is quite distinct in appearance from the run of electric signs.




The Dennison Sign.

In the first place it has a distinctive color—the light emerald green of the Cooper-Hewitt light. Then it has the appearance of being painted on its background of clouds with some sort of phosphorescent paint.

As you look at it you cannot distinguish where the light comes from and you wonder what makes the letters so distinct. It is reflected light from Cooper Hewitt lamps located at the base of the supporting irons.

The letters in the sign, which reads "Dennison Mfg. Co." are made of wood, painted white and mounted on a framework of galvanized iron pipe. The capital letters are ten feet high and the small letters five feet high. The illumination is accomplished by eight type H automatic lamps, each placed in a galvanized iron box with glass door.

The lamps are equipped with a specially designed reflector which directs the light so as to cover the entire surface of the letters.

The sign is 80 feet long and the top

of the tallest letter is 19 feet from the roof. The total wattage is 1,380, about half the current, it is estimated, that would be required to properly illuminate a sign of this size with incandescent bulbs.

A sign on the end of another building, consisting of the single word "Dennison" the same size as the word in the main sign, is illuminated by four type H automatic lamps.

The photograph here reproduced was taken at dusk and was not retouched, proving that the readability of this type of sign is not diminished by halation.

A large number of the same lamps that illuminate the sign are used throughout the Dennison factory for the purpose of illumination.

## A New Receptacle.

A new combination flush receptacle manufactured by the Arrow Electric Company, Hartford, Conn., is shown in the accompanying illustrations.

This new receptacle can be used interchangeably with standard receptacles now on the market, and has the added feature of being adapted for use with a "polarity" plug as well as standard plug. The interior of the receptacle is grooved to allow the insertion of the "polarity" plug in only one position, but not interfering with the insertion of the standard plug either way.

Combination Flush Receptacle.

Standard Plug.

Polarity Plug.

The use of the "polarity" plug is of great advantage where a fixed polarity of current is required, as for example in the use of electrically driven machines or storage batteries.

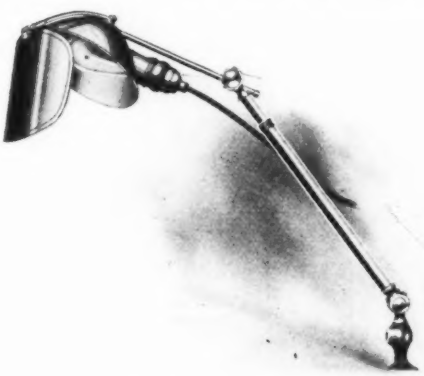
As the present contract for lighting the streets of Bombay, India, expires in 1915, it is probable that electric lighting will be employed thereafter.

## Exide Battery for Fast Hydroplane.

What promises to be the fastest hydroplane in the world is *Neptune IV*, built for Lawrence D. Buhl, of Detroit, Mich., at Atlantic City, N. J., and designed by Adolph Apel, of Ventnor Heights, N. J. It is 32 feet long, with an eight-foot beam. In a recent preliminary trial this hydroplane is reported to have made 58 miles per hour. It is equipped with a six-cylinder, four-cycle, high-compression gas engine, which will develop 500 horsepower. It is equipped with a self-starter for which current is furnished from a three-cell, type X Exide starting and lighting battery. This is the same design of storage battery that has proven so successful for automobile self-starting. The Exide battery, manufactured by the Electric Storage Battery Company, of Philadelphia, is the standard starting battery used in all Delco self-starting and electric lighting apparatus. This outfit will be installed this year in 100,000 motor cars.

## A New Wall-Bracket Lamp.

The Beers Sales Company, 1005 Broad Street, Bridgeport, Conn., is placing upon the market the Lyhne bracket lamp No. 600, which is shown in the accompanying illustration. This fixture has a single, telescoping, double-jointed arm and is thus universally adjustable and can be attached to the top or side of a desk or table or to the wall. It is supplied with a mercerized green cord and attachment plug. It makes a most effective and convenient lighting arrangement not only for desk use but for dentists, engravers and various special applications where a portable lamp is not so convenient. The length when closed is 14 inches; when extended, 30 inches. It is supplied with a parabolic reflector and an adjustable revolving opaque shade. It is thus possible to direct a concentrated beam where it is wanted, at the same time keeping the direct light out of the eyes very effectively.

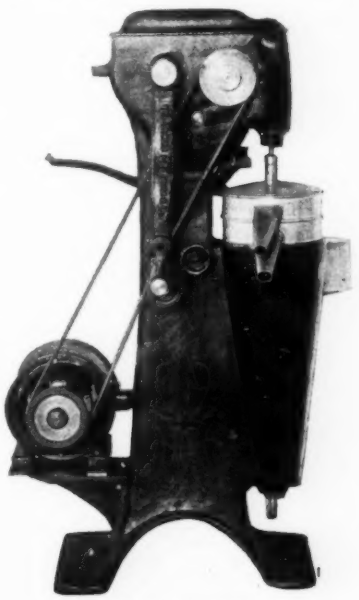


Lyhne Bracket Lamp.

## Separating Milk and Cream By Electricity.

Hand skimming cannot be considered as either a modern or successful means of separating cream from milk, whether for dairy use or in butter making for home consumption. The illustration shows the facility with which electric drive can be applied to a tubular separator, which will yield in different sizes of the same type of machine up to 950 pounds per hour. Separation is accomplished by centrifugal force primarily exerted by the separator bowl or cylinder which revolves at a very high rate of speed. A 0.25-horsepower, compound-wound, open-type motor, running at 1725 revolutions per minute is used to drive the separator, but the motor may be readily disconnected and the handle thrown to mesh if hand operation be preferred.

The power separator is manufactured and sold complete by the Sharples Separator Company, Westchester, Pa., the motor supplied being the product of the Diehl Manufacturing Company, Elizabeth, N. J.



Cream Separator.

## Reduced Minimum in Ayer.

The Ayer (Mass.) Electric Light Company has reduced the minimum charge for electric service supplied by the company from one dollar to 75 cents per month, beginning September 1. The energy rates remain the same as before.

## Fire At Sault Ste. Marie.

The power house at Sault Ste. Marie, Ont., was struck by lightning on the evening of August 25 and a fire resulted. The station was put out of operation and loss amounted to thousands of dollars.

## The New Plant of the Beardslee Chandelier Manufacturing Company.

Within the past ten years the Beardslee Chandelier Manufacturing Company, Chicago, Ill., has found it necessary three times to increase the size of its plant. From a small two-story building the business has expanded until today it requires seven floors, each containing more than 8,000 square feet of floor space.

The factory arrangements are such that work started in one department is kept constantly in motion throughout the plant until the finished product is checked in the shipping department.

The machinery department contains over 25 screw machines, lathes, tapping machines, drill presses and other semi-automatic devices. The foundry is located in a large well lighted room, high up in the building, the floor of the foundry being covered with asbestos over which is laid brick, imbedded in sand. The furnaces are sunk flush with the floor to facilitate the handling of the molten brass, and are of steel construction to insure absolute protection against fire.

The spinning lathes are so located that each workman is placed adjacent to a large window close to his work. Convenient arrangements are made for the storing of chucks, spinning brass and tools. Over 4,000 chucks are used in spinning the numerous Beardslee designs.

The chandelier makers' benches are placed close to the windows on the east side of the building. This department extends the entire width of the building, over 70 feet.

The buffing and polishing lathes extend the full length of the building, 125 feet, and 25 men are constantly employed in this department.

The plating and lacquering departments are located in a large, well lighted room and the material is transferred from the plating to the lacquering department on large quadruple-decked trucks, which eliminate the necessity of stacking any of the work.

The assemblers' benches are placed alongside of the windows adjacent to long rows of steel bins containing nipples, iron bodies, crowfeet, and other finished material. Long benches covered with soft canton flannel are used for receiving the assembled chandeliers.

An important feature of the equipment of this plant is a spiral chute extending from the top floor of the building to the shipping room on the main floor. This chute is made of iron, eight feet in diameter, with a total length of over 80 feet. It is divided into three sections; the first connecting the top floor with the buffing, plating and lacquering departments; the second connecting these departments with the assembling and stock rooms, and the third connecting the assembling departments with the shipping room.

A large stock of glassware is carried to enable proper selection of fixtures of any character, and this stock is placed on the main floor connected with the shipping room.

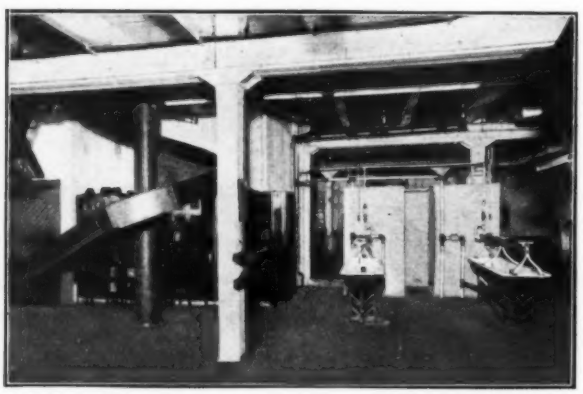
In addition to a large main display room, there are two small rooms fitted up to display indirect and semi-indirect chandeliers.

A show room for the use of dealers and a corps of salesmen is furnished to help the customers of the company close or-

Chandelier-Makers' Department.

Buffing and Polishing Department.

Corner of Main Show Room.



Spiral Chute, Employees' Lockers and Lavatories.

ders with any prospects who wish to see the chandeliers before placing their orders.

Ample office room has been provided for the executive organization, and the designing departments. The accompanying illustrations give a good idea of the generous manner in which provision has been made for every department, and the extent to which manufacturing efficiency has been carried in order to produce a permanently satisfactory product.

## Porcelain and Pottery Art Lighting Fixtures.

A unique development in artistic lighting fixtures for indirect lighting and also for direct lighting is the extensive line of art pottery and white porcelain fixtures placed on the market by the Rush Brothers Company, 136 West Lake Street, Chicago. They are built in the belief that any lighting fixture occupies such a conspicuous place in any room and is so serviceable that it is the natural thing for the employment of beautiful pottery instead of as a valuable but idle ornament on a side shelf, bookcase or mantel. As the result of skillful development in modeling, glazing and decorating, many beautiful designs have been produced both in bowls for indirect lighting and in various forms of ceiling frames and brackets for direct lighting.

The white porcelain fixtures are peculiarly suitable for rooms finished throughout in white, such as bath rooms, lavatories, kitchens, many parts of hospitals, etc. All of the fixtures are waterproof and readily washable. They do not tarnish like most metal fixtures and their color and glaze is permanent.

Bowls for indirect lighting are all made with a white porcelain interior surface which itself constitutes an efficient reflector and does not require separate reflecting equipment. This makes the fixtures simple and durable. They are very easily cleaned. Each indirect bowl is provided with a duplex or double-ended porcelain socket, mounted directly in the center. Each bowl has a small and inconspicuous removable knob at the outer center; on unscrewing this the extra or direct socket is revealed; it may be used for an emergency direct lamp or for attaching a drop cord to a table directly below. For shallow bowls a cluster socket is used inside.

A few designs of these fixtures are shown in the accompanying illustrations. Fig. 1 shows a Roma bowl and canopy in which the relief work is tinted. The body color is a matt ivory or rich cream color and the relief work is given delicate natural colors, chiefly water-color green. This fixture is 36 inches long over all; the bowl is 16 inches in diameter and 8 inches deep. The removable knob referred to above is shown at the bottom, forming a center to the design.

Fig. 1.—Roma Pottery Bowl and Canopy for Indirect Lighting.

Fig. 2.—Etched and Decorated Porcelain Bowl and Canopy.

Fig. 2 is a beautifully decorated porcelain bowl and canopy. The exquisite beauty of the decoration cannot be reproduced in photograph or half-tone illustration. The hand decoration is in soft tones and the etching in gold. Silk corded rods are used in place of the ordinary chains. The full length of the

Fig. 3.—Pompeian Pottery Ceiling Light.

Fig. 4.—Roma Portable Bookcase or Piano Bowl for Indirect Lighting.

fixture is 36 inches. The bowl is 18 inches by 8 inches. Four sockets are provided.

In Fig. 3 is shown a ceiling cluster finished in Pompeian or matt grayish green. The design is simple but graceful and is peculiarly adapted to round-bulb frosted lamps. This fixture is 16 inches in diameter.

Fig. 4 shows a unique Roma pottery bookcase or piano urn arranged as a portable indirect lighting unit and provided with silk cord and attachment plug. The bowl is 8 inches deep and 14 inches in diameter. The color is matt ivory with the relief work in delicate green.

A fine dull or Bedford green bracket is shown in Fig. 5. The upper surface can be used for a fern or other potted plant. A push-button switch is incorporated in the design. The dimensions of the bracket are: height 13 inches, face width 8 inches, depth 6 inches.

The foregoing illustrations give but a crude idea of the variety and richness of the designs. All of the fixtures, being of solid pottery or porcelain, are shock-proof and require no insulating collars in their mounting. They are fastened to a simple fixture stud or crowfoot and are easily installed. All fixtures are wired complete and ready for hanging.

## A Novel and Artistic Electric Table Fan.

A novel and artistic design of an electric table fan may be seen in the accompanying illustration, so constructed that all parts of the table and room receive an equal distribution of air at the same time and all the time, the deflector causing a continuous direct breeze on all sides.

This device is most efficient in its operation, and the deflecting plate forms a convenient stand for a fern dish or flowers. The entire equipment is an ornament to the table, being beautifully finished in polished nickel and dull satin jet. A silk-covered cord conducts the current from the plug of an ordinary lamp socket to the universal electric motor. This is supplied by the Fulton-Bell Company, 2 Rector Street, New York, N. Y.

Fig. 5.—Bedford Pottery Bracket.

Table Fan.

## Outing of Fixture Company.

The McKenny & Waterbury Company, Boston, the largest lighting fixture house in New England, celebrated its twenty-fifth anniversary with an outing and banquet at Nantasket Beach, August 28. About fifty of the office force, salesmen and department heads attended. The banquet hall was decorated with an electrically illuminated facsimile lighthouse which bore the firm motto: "We Light the World."

W. A. McKenney presided, and remarks were made by John J. Tobin; James Brennan, of Philadelphia; Alexander Patterson, of New York, and H. L. Nason, of Boston. The speakers commented on the firm's growth from small beginnings to the present large organization, which includes 102 persons. An entertainment of songs, monologs and musical specialties concluded the evening.

## Copper Exports.

For the first six months of this year the exports of copper from the United States totaled 193,936 tons, compared with 172,441 tons for the same period in 1912.

# Current Electrical News

## LIGHTING AND POWER.

*(Special Correspondence.)*

MOUNTAIN LAKE, MINN.—At a special election the vote for electric lighting carried. C.

NEW MUNICH, MINN.—This village will soon install an electric light and power plant. C.

AMHERST, VA.—$10,000 will be expended to secure electric lighting. Address the mayor.

SIOUX CITY, IOWA.—The Council is in favor of constructing a $5,000 electric light and power plant. C.

LEWISTOWN, MONT.—The city has decided to put in 110 cluster lights along Main Street and the avenues. C.

ALEXANDRIA, MINN.—This city will install a "White Way." The system is to be extended later as desired. C.

EATONVILLE, WASH.—At a recent election bonds in the sum of $12,000 were authorized for a lighting system.

SALUDA, N. C.—A modern electric light plant will be installed. Address the mayor in regard to the matter.

LAKE WORTH, FLA.—The city will grant a franchise to Percy Hagerman to erect electric lighting system here.

NEWARK, ARK.—L. P. and W. J. Caldwell have been granted a franchise to establish an electric light plant here.

SUDBURY, MASS.—This town is about to install a large number of additional street lamps. W.

HENDERSON, KY.—The city will improve the electric light plant here at a cost of $25,000. Address the city clerk.

HURLEY, S. D.—A co-operative company was organized to establish an electric light system. The president is E. E. Berry. C.

FERGUS FALLS, MINN.—The City Clerk will call for bids and plans for the "White Way" on Lincoln Avenue and Mill Street. C.

CHICAGO, ILL.—The Commonwealth Edison Company will erect a substation at Cottage Grove Avenue and Sixty-second Street.

CLAY, KY.—Clay Light & Ice Company will add a 30-kilowatt alternating-current belt-driven generator and accompanying machinery.

WOOD LAKE, MINN.—Earl D. Jackson, consulting engineer, St. Paul, is preparing plans for a 13-mile transmission line for Granite Falls. C.

HENDERSON, MO.—This place will spend about $25,000 improving its municipal electric light plant. All out-of-date machinery will be replaced.

CARLISLE, KY.—The Carlisle Electric Light & Power Company will build a 10-ton ice plant to be operated in connection with its power plant. G.

GARRODSBURG, KY.—This city will enlarge its municipal lighting plant, a committee of the Council now working out details regarding an appropriation.

GAINESVILLE, MO.—The Missouri Electric Gas & Water Company is planning to construct a one-mile distributing system.

STAUNTON, VA.—The Board of Aldermen has decided to build a municipal electric light plant here at a cost of about $23,000.

LAKELAND, FLA.—The Lakeland Dairy Farm is planning to install an electric system. Address A. J. MacDonough for information.

COLUMBIANA, ALA.—The Columbiana Light & Power Company has been incorporated with a capital stock of $25,000 by J. H. Crumpton and associates.

PRAIRIE GROVE, ARK.—The city is planning to install an electric light and power plant here to cost $50,000. Address the city clerk.

BARABOO, WIS.—The Baraboo Lighting Company will begin work on the construction of the new lighting system, which has been adopted by City Council. C.

BAKER, ORE.—Bids are soon to be requested for construction of the proposed municipal lighting plant for which the sum of $25,000 in bonds was recently voted.

LUCK, WIS.—At a recent election it was decided to bond the village to the amount of $9,000 for the purpose of installing an electric lighting system and waterworks. C.

OLYMPIA, KY.—The Olympia Springs Railway, Power & Light Company has been incorporated with a capital stock of $50,000 by James D. Wilson, J. Frank Taylor and others.

BURLINGTON, IOWA.—A dam is to be built across the Shell Rock River, where sufficient power can be obtained to light the town and supply current for different purposes. C.

LOUISVILLE, KY.—O. F. Wolke, of the Dixie Manufacturing Company, this city, will purchase an electric motor for a machine shop, which the company is preparing to equip. G.

LA PINE, ORE.—It is reported that the Pringle Falls Electric Power & Water Company will begin work within a month on a plant on its power site a few miles northwest of this city.

BLISSFIELD, MICH.—The Council instructed Electrician Ray Ellis to investigate the cost of some necessary changes to enlarge the plant, including the addition of new machinery.

MARINETTE, WIS.—The Squaw Point Hunting and Fishing Club is contemplating lighting its camp at Squaw Point with electric lamps. Current is to be furnished from batteries. C.

WHEELING, W. VA.—The Peterson Electric Company has been incorporated with a caiptal stock of $10,000, by Joseph A. Armstrong, Hugo Peterson and others.

GOSHEN, IND.—The Central Electric Company, of South Bend, has closed a contract with the Goshen City Council to install a complete system of ornamental street lighting in that city.

IRON RIDGE, WIS.—Iron Ridge Electric Power Company has been incorporated with a capital stock of $6,000. The incorporators are Walter P. Bentze, John Kloechner and A. D. Volkman.

PORT ARTHUR, TEX.—A great "White Way" along Proctor Street from Houston Avenue to Austin Avenue and along Austin Avenue from Sixth Street will be constructed. Address the mayor for particulars.

GRAND RAPIDS, MICH.—Boulevard lighting is to be installed on South Division Avenue to Oakes Street. General Manager Cutcheon, of the Board of Public Works, states that the installation is to be made at once.

TACOMA, WASH.—B. W. Collins, superintendent of the city electric light and power department, is getting out data with a view to establishing a new lighting system on A Street, Pacific Avenue, Commerce and C Streets. O.

LOS ANGELES, CAL.—The property owners along Olive Street have notified the City Council that they will pay for the extension of the cables and conduits, which work the Los Angeles Gas & Electric Company has refused to do.

KENT, CONN.—A charter has been granted to organize the Kent Electric Light & Gas Company, with a capitalization of $3,000. The purpose of the company will be to furnish electricity for lighting the streets and dwellings, and for power.

LEBANON, ORE.—It is said that the Santiam Power Company expects to utilize the falls at Waterloo for power purposes and that it will supply power to the Lebanan paper mills and other industries. It is thought the enterprise will be completed this fall. O.

INDIANAPOLIS, IND.—Charles J. Murphy, of the Public Service Commission, has granted permission and given an order to the Mooresville Public Utilities Company to issue $10,000 six-per-cent, first-mortgage bonds with which to purchase machinery for the plant.

ORRVILLE, O.—Orrville, with 3,000 population, was more than ten to one, in favor of issuing bonds amounting to $41,000 for a municipal electric plant. Before selling the bonds it must be determined legally whether the Doherty Syndicate of New York has a valid four-year contract with the village.

MOUNT VERNON, WASH.—Negotiations have about been closed with the Northwest Traction Company to run a power line out from Allen and by way of Avon and the Olympia Marsh district into West Mount Vernon. W. W. Conner represents the districts to be served

and it is thought that work will be started in the near future. O.

EUGENE, ORE.—The Oregon Power Company has contracted with the Portland, Eugene & Eastern Railway to furnish all the electricity for the lines of that company between Eugene and Salem. The power will be supplied from the Springfield plant and a 33,000-volt line will be run to Albany in addition to the present 11,000-volt line. O.

LOS ANGELES, CAL.—The City Council has instructed the City Attorney to prepare an ordinance calling for a special election, at which time bonds in the sum of $6,500,000 will be voted upon, the proceeds from which will be devoted to the completion of the power plant and providing a distributing system. The election will probably be held on October 15.

BURNEY FALLS, CAL.—The application of the Pitt River Power Company for permission to operate a power system from an installation at this point, was heard by the Railroad Commission a few days ago. The company contemplates a 1,000-horsepower development. The directorate comprises Dr. William F. Blake, W. T. Jeter, J. H. Logan and John F. Sheehan, Jr.

COHOES, N. Y.—The Public Service Commission has received an application from the Cohoes Company for permission to construct a hydroelectric plant on the Mohawk River at Cohoes for the generation of electricity for the supplying of electric power, instead of water power now furnished to mills, manufactories and others, and the exercise of franchises received from the State.

STEVENSON, WASH.—The Secretary of Agriculture has granted a final water-power permit to E. P. Ash and Sam Samson, of this city, for a site on the Wind River. A wood-stave pipe line will be used for conveying the water to the power house, where a 750. kilowatt unit will be installed direct-connected to a Pelton water wheel. The power will be used for logging operations. O.

VAN NUYS, CAL.—M. Miller, a rancher of this place, has just announced that he, in conjunction with C. Q. Stanton, owner of an adjoining piece of property, will in the near future install a system of ornamental electric-lighting standards along Sherman Way, through the Van Nuys-Lankershim lands to San Fernando, and will maintain an electric lighting system between these points. T.

HEMET, CAL.—It is rumored here that the Edison Electric Company intends to install a network of lines throughout this territory. This work will be done in an effort to block the move of Ralph Bandini, a Los Angeles attorney, who, it is stated, intends establishing an electric system here. Mr. Bandini will generate 7,000 horsepower from the south fork of the San Jacinto River at a cost of $200,000. T.

BIDDEFORD, ME.—York County Power Company has been incorporated with a capital stock of $3,000,000 for the purpose of manufacturing and selling gas and electricity for heat, light and power. The incorporators named are William M. Bradley, who is president of the company; William M. Bradley, Charles F. Berry, Charles Bancroft, C. H. Prescott, H. B. Ivers, W. M. Bradley, C. F. Berry, P. D. Marshall and William S. Linnell.

ROCKVILLE, W. VA.—The Hydro-Electric Company, of West Virginia, headed by Pittsburghers, has preliminary plans prepared for the building of a $5,000,000 power plant and dam near Big Sandy Creek. The dam will be of concrete, 200 feet high and 1,600 feet long. The power house will be 60 by 100 feet and will contain equipment for generating 65,000 horsepower. Work will be begun in the spring, provided the state officials approve the plans.

POTTSVILLE, PA. — The Eastern Pennsylvania Light, Heat & Power Company, an electric combine which has already absorbed most of the lighting companies in the larger towns of Schuylkill County, announces its intention of adding ten more companies to its list, all of which are expected to be incorporated at Harrisburg in September. Some of these companies will be located at Girardville, Gilberton, Ryon, West Hahanoy and Butler townships. The incorporators are W. B. Rockwell, general manager of the Eastern Pennsylvania Railway Company; Ira G. Walborn, superintendent, and Van Dusen Rickert, treasurer of the Pottsville Edison Electric Illuminating Company.

GLENDALE, CAL.—The Electric Lighting Department of this city has been awarded the contract for the installation of the street lighting system in Casa Verdugo, a town lying just north of this place. Harry B. Lynch, manager of the local lighting department, states that his bid was $10,000. This department has also been awarded the contract for the installation of the lighting system along Canada Boulevard. Mr. Lynch is now calling for bids for 120 single-lamp cast-iron standards, 183 street-lamp reflectors, one constant-current regulator and panel, 30,000 feet of armored cable. The local department will also furnish globes and electric current to these districts, the charge for the latter being 65 cents per month per lamp. T.

RIVERSIDE, CAL.—The merger of four large electric power systems has just been announced at this place. The intention of this giant corporation is to furnish current for the operation of industries in Western Nevada, the eastern portion of California and a large part of Southern California. This announcement was made by Delos Chappell, president of the Southern Sierras Power Company. The companies which have joined hands are The Silver Lake Power & Irrigation Company, The Pacific Power Company, The Nevada-California Power Company and the Southern Sierras Power Company. The various systems will be connected by the building of new lines. Elaborate improvements and extensions are planned. T.

LOVELAND, COLO.—Plans for one of the largest hydroelectric power plants in the United States, with a capacity for generating 50,000 horsepower, has come to light through overtures made to the Light Committee of the Loveland City Council. Surveys have been completed by a party of engineers along the Big Thompson River between Estes Park and a point near the entrance of the Loveland canon, and filings have been made which allow the company to proceed with the work of organization. $3,000,000 will be required to finance the scheme. The plan is to divert the water of the Big Thompson near Estes Park and carry it through tunnels and flumes to a point eight miles this side of the park, where a natural reservoir is to be found with a capacity of millions of cubic feet. From here the mountains again will be tunneled to what is known as the second canon, on the Loveland-Estes Park highway, and where a fall of 1,500 feet can be obtained. In all, the water will be carried a distance of 22 miles to secure this elevation above the river. It is estimated that electricity can be manufactured at a cost of less than one cent per kilowatt. At present the lighting rate here is 12 cents per kilowatt. It is understood the company expects to supply electricity throughout Northern Colorado.

## TELEPHONE AND TELEGRAPH.

*(Special Correspondence.)*

BUSHNELL, ILL.—Todd and Slusher have been granted a franchise to establish a telephone system here.

AKRON, O.—$3,500 will be expended placing the fire-alarm wires underground. Address the city clerk.

BEND, ORE.—It is announced that the Deschutes forestry officials will string 21 miles of telephone lines this fall. O.

MINNEAPOLIS, MINN.—Farmers' Mutual Telephone Association has been incorporated with a capital stock of $7,500.

SUPERIOR, WIS.—Tentative plans are being prepared for a police telegraph system. Address the City Electrician in regard to the matter.

MEDFORD, OKLA.—The city will rebuild the electric light plant, which was recently damaged by fire at a loss of $12,000. Address the mayor.

RICH SQUARE, N. C.—The Rich Square Electric Company has been incorporated with a capital stock of $50,000 by M. Bolton, J. T. Bolton and others.

WAUKEGAN, ILL.—The Government will start work at once on a powerful wireless station to be erected near here, at an approximate cost of $100,000. C.

TROY, ALA.—The Southern Bell Telephone Company, will enlarge its exchange here. Address the chief engineer at Atlanta, Ga., for information.

SOMERSET, KY.—The Somerset & Mintonville Telephone Company has been incorporated with a capital stock of $660, by W. H. Waddle, Oscar Girdler, C. H. Fisher and others.

BRYANTSVILLE, KY.—C. C. Becker is president of the Bryantsville Telephone Company, which will put in a local and rural telephone system. The cost of the plant is to be $3,000. G.

MOSCOW, IDAHO.—It is announced by Manager T. A. Meeker of the Moscow Telegraph & Telephone Company, that two new toll lines will be built out of the city at a cost of $10,000. The work will be started within three months. O.

YOUNGSTOWN, O.—The Central Union Telephone Company announces that it will begin at once an extension to its new exchange building on West Reyen Avenue which will cost $22,000. Architects Stanley and Scheibel have prepared plans.

MARSHFIELD, WIS.—The Marshfield Rural Telephone Company has made plans to string 37 miles of telephone wire this year from this city to Rozellville, and possibly back to Hewitt, with sidelines to bring everyone in that territory into contact with Rozellville and Marshfield. C.

OPELOUSA, LA.—At the October meeting of the Board of Aldermen bids will be received for a $5,000 fire-alarm system. It will take about six miles of wire to cover the territory over which the alarm system will be established. Ad-

dress Fire Chief Brown for further information.

MONMOUTH, ILL.—A telephone company is being organized with a capital of $75,000 to install an exchange in the city. A switchboard large enough to meet the demands of this rural service and also to take care of the local business will also be installed. Address H. E. Shugart, chairman, for information.

PARIS, KY.—The Paris Home Telephone & Telegraph Company has been incorporated by S. M. Heller, J. D. Powers and others, of Louisville, Ky., the plant and franchise of the Bourbon Home Telephone Company, of Paris, having been purchased at a receiver's sale. The new company is incorporated with $30,000 capital stock. G.

BRAINERD, MINN.—The Minnesota Telephone Company has determined to construct a telephone exchange here connecting with the Tri-State lines in competition with the Northwestern Telephone Exchange Company. The new company has filed with the Council plan of proposed lines on streets and alleys and is operating under a franchise secured by H. F. Mann.

OROVILLE, WASH.—The Oroville Development League has received a communication from the business men of Penticton, B. C., that the British Columbia Government is planning to extend its telephone line from Penticton to Fairview and Osoyoos and urging that the Pacific States Telephone Company be induced to extend its line from Oroville to connect with this line. O.

EUGENE, ORE.—The government telephone line, which now reaches only to the top of the Cascades will be extended to connect with the lines in the central part of the state. Chief Forester Charles H. Flory of the Oregon and Washington District, S. C. Bartrum, supervisor of the Umpqua, and Clyde R. Seitz, supervisor of the Cascade Forest, have the matter in hand. O.

ANN ARBOR, MICH.—The Michigan State Telephone Company, which has taken over the property of the Washtenaw Home Telephone Company, has improvements in its service and holdings under way which will cost more than $119,000. Estimates for the rebuilding of the Ypsilanti plant at a cost of $25,000 have been approved and new equipment will be installed, at Manchester, Miland and Chelsea.

## ELECTRIC RAILWAY.

*(Special Correspondence.)*

BRAINERD, MINN.—Brainerd has granted a street-car franchise to George Reed, of Duluth. C.

SHREVEPORT, LA.—The North Louisiana Electric Railway Company will build an interurban line from Shreveport to Monroe. G.

SARASOTA, FLA.—The City Council is planning to grant a franchise to Owen Burns to operate an electric railway on certain city streets.

JACKSON, TENN.—The Jackson Railway & Light Company will probably build a new car line to West Jackson. John Wisdom is general superintendent.

DAYTON, FLA.—The Central of Florida Railway Company, will construct an electric railway. The company will establish a 75-horsepower plant to furnish current for operating of cars.

LOUISVILLE, KY.—The Louisville Interurban Railroad Company is completing arrangements for the extension of its Orell suburban line to Kosmosdale. G.

ROCHESTER, MINN.—There is every prospect that the St. Paul & South Minneapolis Electric Railway will extend its line from Rochester to Decorah, Iowa.

SAN FRANCISCO, CAL.—At the annual meeting of the stockholders of the United Railroads, Jesse W. Lilienthal was chosen president to succeed Patrick Calhoun.

GRAND RAPIDS, MICH.—The Grand Rapids, Grand Haven & Muskegon Railway Company will expend $150,000 improving its plant. W. K. Morley is general manager.

OKLAHOMA CITY, OKLA.—Capital Traction Company has been incorporated with a capitalization of $10,000 by D. M. Wilson, H. S. Hurst, S. A. V. Howell, of Oklahoma City.

SPRINGFIELD, ORE.—From an authentic source comes the report that the Oregon Electric Railway Company will extend its lines from Eugene to this city in the near future. O.

RED LODGE, MONT.—C. A. Gibson has completed a survey of the proposed electric line from here to the Washoe and Deer Creek Coal mining camps. The estimated cost of this line is $50,000. C.

FENTON, MICH.—An electric railway from Flint to Long Lake will probably be erected at a cost of about $200,000. The distance is over 15 miles. Vincent R. Coon, of Detroit, Mich., and Chester H. Bliss, of Flint, are interested.

TACOMA, WASH.—General Manager Bean, of the Puget Sound Electric Company, announces that a block signal system will be installed and the roadbed greatly improved on the interurban line between Seattle and Tacoma, at a cost of $60,000. O.

CLEBURNE, TEX.—The Dallas Southwestern Traction Company has been granted a franchise by the City Council for the use of certain streets of the city for its interurban electric line that is to run between Dallas and Glen Rose. D.

SHERMAN, TEX.—The Texas Traction Company has under consideration the proposition of extending its interurban electric railway from Sherman to Ardmore, Okla. The proposed extension involves the building of a bridge across the Red River. D.

SANTA MONICA, CAL.—I. M. Taylor & Company, Boston brokers, have indicated that they have in project an electric line between Los Angeles and this city. The erection of this line will bring another electric railway company to Southern California. T.

HENRYETTA, OKLA.—Henryetta Interurban Railway Company has been granted articles of incorporation with a capital stock of $50,000. The incorporators are William Brink, W. R. Wilson, J. W. Kincaid, C. J. Harrison and C. H. Kellogg, all of this city.

NEW ALBANY, IND.—The New Albany & French Lick Valley Traction Company will build a line costing $1,400,000 from New Albany, Ind., to French Lick Springs, Ind., a distance of 60 miles. Charles W. Schindler, New Albany, Ind., is attorney for those interested. G.

NASHVILLE, TENN.—The Cumberland Valley Electric Railway Company is considering the construction of a traction line from Nashville to Sparta, by way of Smithville, Alexandria and Auburn. H. T. Stewart, Woodbury, is one of those interested in the project. G.

NORFOLK, W. VA.—The Elkhorn Valley Traction Company has been incorporated with a capitalization of $100,000 for the purpose of constructing, maintaining and operating interurban railways. The incorporators are L. E. Tierney, Powhatan; L. H. Clark, Kyle; W. E. Stuart, Keystone, and A. Catzen, Northfork.

IOWA CITY, IOWA.—F. J. Kipp, millionaire exbanker, Milwaukee, has offered to build a railroad between Iowa City and Keota, a distance of 36 miles, if the citizens here and farmers between the two terminals would purchase $350,000 of stock. Iowa City has apportioned $100,000 and Keota $60,000. C.

SAN FRANCISCO, CAL.—San Francisco voted bonds in the sum of $3,000,000 for the extension of the municipal street railway system in competition with the privately owned United Railroads of San Francisco. The proposed lines will converge toward the site of the Panama Pacific Exposition and are designed to solve the transportation problem in connection with that undertaking.

MADISON, WIS.—The Chicago & Wisconsin Valley Railroad Company, of Madison, which was recently reorganized and recapitalized, has been granted the necessary franchises by various cities and counties upon certain conditions. The first line will be built from Madison to Portage, including city systems. About 250 miles of electric railway will ultimately be built, radiating from Madison.

LOS ANGELES, CAL.—Articles of incorporation have been filed for the San Joaquin Valley & Los Angeles Railway Company, with a capital stock of $3,000,000, by T. E. Gibbon, W. C. Shuelton, J. E. Stephens, J. E. Shuelton and J. R. Colburn. The company plans to build a road from Los Angeles to a point in Lower San Joaquin Valley, which will parallel in a general way the route of the State Highway through the Tejon Pass.

MINNEAPOLIS, MINN.—The Minneapolis & Northwestern Traction Company has been incorporated with a capital stock of $1,000,000. The purpose of the company is the building of a line of suburban railroad from Minneapolis northward. The incorporators are T. D. and A. E. Woodbury, Theodore A. Chadwick, Achille D. Soulite, Eugene C. Garwood, William E. Ellis, August Schaugen, Edward Houlit and G. M. Lawrence. Mr. Garwood said that the company may build from Minneapolis to Brainerd but that the exact route is not yet decided upon.

SARASOTA, FLA.—The first step in a project for connecting Sarasota with the Manatee River cities by an interurban railroad has been taken in the form of a proposed ordinance presented to the City Council by Cary B. Fish, an attorney for Owen Burns, now in New York, where he has been negotiating with capitalists who specialize in railroad construction. The ordinance, if adopted, would grant a 30-year franchise to operate a railroad on Twelfth and Main Streets and Orange and Osprey Avenues. The County Board will be asked to make a similar grant for the territory outside the limits of incorporated towns.

## FOREIGN TRADE OPPORTUNITIES.

*(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.)*

No. 11,571. MACHINERY.—The Corporation, Wakefied, Yorkshire, England, will receive tenders for water-tube boiler, superheater, stoker, etc., steam-turbo-alternator, condensing plant, high and low-tension switch gear, etc. Specifications may be obtained of the City Electrical Engineer, Old Town Hall, upon payment of $4.87.

No. 11,568. ELECTRIC LIGHTING MACHINERY AND PLANT.—Tenders are invited by the Egyptian Ministry of the Interior for supplying the machinery and plant required for the installation of electric light in the town of Samanhour. The contract will be divided into two parts, (1) generating plant and equipment and the lighting of the central station, (2) the distributing system. The offer may be for the complete installation or for either section. Sealed tenders will be received until October 31.

No. 11,580. SULPHATE OF COPPER.—The Postmaster General, Melbourne, Australia, invites tenders until September 23 for 300 tons of sulphate of copper. Particulars may be obtained from the High Commissioner, Australian Commonwealth, 72 Victoria Street, London, S. W., England.

## NEW PUBLICATIONS.

THERMOCOUPLE CORRECTIONS.—The Bureau of Standards has issued Technical Paper No. 202, entitled "Note on Junction Corrections for Thermocouples." This contains matter of value to those engaged in the precise measurement of temperature by means of thermocouples.

RESISTANCE THERMOMETERS.—Technical Paper No. 200, published by the Bureau of Standards, Washington, D. C., is entitled "New Calorimetric Resistance Thermometers," by H. C. Dickinson and E. F. Mueller. This describes a type of thermometer designed at the Bureau laboratory and used there in connection with heat measurements.

SULPHUR IN ILLUMINATING GAS.—The Bureau of Standards, Washington, D. C., has issued Technologic Paper No. 20 entitled "Determination of Sulphur in Illuminating Gas," by R. S. McBride and E. R. Weaver. This describes the apparatus and methods available for this work and gives recommendations for its use.

## FINANCIAL NOTES.

It is understood that Westinghouse Electric's July net was slightly more than $470,000, which is a record month's profit. Not only were the July net figures record breaking, but the four months to July 31 were also the best four consecutive months the company has ever had. It is stated that net profits for dividends for the four months from April 1 to August 1, after interest and sinking fund obligations, were in round figures $1,650,000, which is only $100,000 less than the entire year's dividend requirements for the preferred and the $36,700,000 common stock. By September the company will have earned $200,000 to $300,000 more than the full year's dividend needs, leaving seven month's net as velvet. Could the company continue for the full twelve months to March 31 next as it has been going for the last four, shipments would considerably exceed $40,000,000. Some recent months have seen incoming orders of nearly $4,000,000, or at the rate of $48,000,000 per annum. This compares with an actual gross in 1912-13 year of $39,977,000.

General Electric's incoming business at the present time is running at a rate equal to the capacity of the plants, or about $110,000,000 a year. This is a considerable falling off from the first six months of the year, which, however, set a new record on orders, at a rate of $15,000,000 or more above current business. Unfilled orders at the beginning of this year were so large and the excess of orders in the first six months above capacity was so great that the General Electric has business enough in sight to carry it through the balance of the year. The total value of orders received last year was practically $103,000,000. Considering the great activity of the first half of the year, 1913 should show a volume of orders received of $110,000,000.

The Tevis-Hanford Company, which placed the $1,600,000 collateral six-per-cent notes of the United Power & Light Company of New Jersey has received notice that the funds to pay the interest on these notes defaulted June 1, have been deposited in the Bankers' Trust Company.

John B. Dennis, chairman of the committee representing the six per cent notes of the Kansas City Railway & Light Company, due September 1, 1912, announces that arrangements have been made by which the interest on these notes from March 1, 1913, to September 1, 1913, will be paid to the holders at the New York Trust Company on and after September 2. Notes and certificates of deposit of notes must be presented for endorsement.

Bankers for the American Cities Company and the United Gas & Electric Corporation have arranged for the purchase by the United Gas & Electric Corporation of the outstanding $16,264,700 common stock of American Cities Company by exchange of second preferred and common stocks of United Gas & Electric Corporation.

The basis of exchange will be $75 par value second preferred and $25 par value common stock of United Gas & Electric Company common. To provide for the consolidation, a special meeting of stockholders of United Gas & Electric has been called for Hartford, September 24, to authorize $12,500,000 additional second preferred stock, increasing the authorized stock capitalization from $45,000,000 to $57,500,000. This second preferred stock will bear cumulative dividends at the rate of two per cent for 1914, three per cent for 1915, four per cent for 1916, five per cent for 1916 and six per cent for 1917 and thereafter.

The stockholders will also vote on the acquisition of the common stock of American Cities Company on the terms stated.

### Dividends.

Consolidated Gas, Electric Light & Power Company of Baltimore; regular semi-annual dividend of three per cent on the preferred stock, and regular quarterly dividend of one and one-half per cent on the common stock, payable October 1 to stock of record September 30.

New York & Queens County Electric Light & Power Company; regular quarterly dividend of one per cent on the preferred stock, payable September 2 to stock of record August 26.

New York Transit Company; regular quarterly dividend of $10 per share, payable October 15 to stock of record September 25.

The Mackay Companies; regular quarterly dividend of one and one-quarter per cent on the common shares, and one per cent on the preferred shares, will be paid October 1 to shareholders of record September 13.

Brooklyn Rapid Transit Company; regular quarterly dividend of one and one-half per cent, payable October 1 to stock of record September 9.

The National Carbon Company; regular quarterly dividend of one and one-half per cent, payable October 15 to stock of record October 4.

New York Edison Company; regular quarterly dividend of one and one-half per cent, payable September 13.

### Reports of Earnings.

LEHIGH VALLEY TRANSIT COMPANY.

The Lehigh Valley Transit Company for July, 1913, and the twelve months ended July 31, 1913, reports earnings as follows:

| | 1913 | 1912 |
|---|---|---|
| July gross | $ 162,461 | $ 137,836 |
| Net after taxes | 98,280 | 79,433 |
| Surplus after charges | 51,614 | 36,969 |
| Twelve months, gross | 1,686,525 | 1,439,648 |
| Net after taxes | 970,948 | 806,432 |
| Surplus after charges | 432,156 | 318,806 |

COLUMBIA RAILWAY, GAS & ELECTRIC COMPANY.

Columbia (S. C.) Railway, Gas & Electric Company reports gross earnings for June, 1913, and the six months ended June 30, as follows:

| | 1913 | 1912 |
|---|---|---|
| June gross | $ 55,023 | $ 52,446 |
| Six months' gross | 352,920 | 270,136 |

FEDERAL LIGHT & TRACTION.

| | 1913 | 1912 |
|---|---|---|
| July gross | $ 184,084 | $ 169,889 |
| July net | 72,811 | 65,052 |
| Seven months' gross | 1,365,617 | 1,208,229 |
| Seven months' net | 579,208 | 502,002 |

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

| | Aug 30 | Aug. 23 |
|---|---|---|
| American Tel. & Tel. (New York) | 130¼ | 129¾ |
| Commonwealth Edison (Chicago) | 147½ | 147 |
| Edison Electric Illuminating (Boston) | 272 | 272 |
| Electric Storage Battery common (Philadelphia) | 47 | 47 |
| Electric Storage Battery preferred (Philadelphia) | 47 | 47 |
| General Electric (New York) | 146 | 145½ |
| Kings County Electric (New York) | 117½ | 117½ |
| Manhattan Transit (New York) | 1⅝ | 1⅝ |
| Massachusetts Electric common (Boston) | 14 | 16 |
| Massachusetts Electric preferred (Boston) | 71½ | 71 |
| National Carbon common (Chicago) | 116 | 114 |
| National Carbon preferred (Chicago) | 113 | 113 |
| New England Telephone (Boston) | 145 | 145 |
| Philadelphia Electric (Philadelphia) | 22¼ | 21⅞ |
| Postal Telegraph and Cables common (New York) | 84 | 84 |
| Postal Telegraph and Cables preferred (New York) | 66¼ | 66¼ |
| Western Union (New York) | 69 | 67 |
| Westinghouse common (New York) | 73½ | 72¼ |

## PERSONAL MENTION.

MR. J. P. DOUSMAN has been re-elected president of the De Pere Electric Light & Power Company.

MR. M. LUCKIESH, of the Physical Laboratory of the National Electric Lamp Association, Cleveland, O., was married on August 23 at Maquoketa, Iowa, to Miss Frances Clark.

PROF. H. H. HIGBIE, formerly head of the electrical department of Wentworth Institute, Boston, Mass., has been elected professor of electrical engineering at the University of Michigan.

MR. D. W. SMITH, lately with the Westinghouse Electric & Manufacturing Company, has associated himself with the Robbins & Myers Company in the position of manager of motor sales.

MR. F. D. MAHONEY has been appointed construction engineer of the Kewanee Light & Power Company. Mr. Mahoney was formerly with the Luzerne County Gas & Electric Company, at Kingston, Pa.

MR. THOMAS A. EDISON was reported ill early in the week at the Lafayette Hotel, Portland, Me., whither he had come with his family from Monhegan, where they had been for a week. The family has been touring in an automobile in New England, it is stated.

MR. C. H. HENDERSON, for a number of years one of the engineers on switchboard and power-station design for the Westinghouse Electric & Manufacturing Company, left Pittsburg on Sunday, August 23, for Havana, Cuba. He has taken a position with the Havana Electric Railway, Light & Power Company. A farewell dinner was tendered him.

MR. W. C. STERLING, SR., president of W. C. Sterling & Son Company, Monroe, Mich., wholesale dealers and shippers of ties and poles, had a narrow escape from death when his automobile was struck by a locomotive at Monroe last week. He was badly injured and for some time his life was despaired of, but the crisis has apparently been passed, and it is now thought that he is on the way to complete recovery.

MR. NORMAN McD. CRAWFORD, who recently resigned as president of the Mahoning & Shenango Railway & Light Company, the principal subsidiary of the Republic Railway & Light Company, will locate permanently in New York City, where he will be connected with electric railway, light and power interests. Mr. Crawford has been president of the Mahoning & Shenango Valley for five years; previous to that time he was with the Ohio Electric Railway Company.

PROF. PHILIP S. BIEGLER, formerly professor of electrical engineering at the University of Montana, Missoula, Mont., has been transferred to the College of Agriculture and Mechanic Arts, at Bozeman, Mont. This results from the recent consolidation of the various state educational institutions under a single State Board of Education. All of the engineering courses maintained by the state will be concentrated in the college at Bozeman, with the exception of the course in mining engineering. This work will continue to be given in the School of Mines, at Butte.

## OBITUARY.

MR. JAMES STEVENSON, of the Crowley & Stevenson Electric Company, Duluth, Minn., was killed in an accident on August 19, in the forty-fifth year of his age. He was also connected with the Northern Electrical Company. Mr. Stevenson was directing repair work in a boiler factory when he was caught between the moving electric crane and a steel girder.

## NEW INCORPORATIONS.

COLUMBIANA, ALA.—J. H. Crumpton and associates have incorporated the Columbiana Ice, Light & Power Company with a capital stock of $25,000.

BOALSBURG, PA.—A Pennsylvania charter has been issued to the Boalsburg Electric Company, having a capitalization of $5,000.

ALMOND, WIS.—Almond Electric Company has been incorporated with a capital of $10,000 by William Brunker, Oscar Culver, S. E. Ralph and A. A. Lepper.

PORTLAND, ORE.—Articles of incorporation have been filed for the Molalla Electric Company, capitalized at $50,000, by Curtis R. Gunzel, J. F. Alexander and M. H. Clark.

QUINCY, ILL.—The Stawil Company has been incorporated with a capital stock of $2,500 to deal in mechanical and electrical specialties. The incorporators are George J. Stahl, J. Russell Williams and Mary B. Stahl.

PITSBURGH, PA.—A charter has been granted the National Insulator Company, capitalized at $5,000. The company will deal in insulators. The incorporators are George A. Young, Andrew Hill, Jr., and William P. Welker.

PORTLAND, ME.—A certificate of organization has been filed by the Idaho Electric Company, to generate and distribute electric current for light, heat and power. The capital stock is $12,000,000. T. L. Croteau is president of the company.

CHICAGO, ILL.—William Knobloch Company has been incorporated with a capital stock of $20,000 to maintain and replace parts of electric vehicles and appliances. The incorporators are William Knobloch, Karola Knobloch and Van Lear E. Farmer.

CHICAGO, ILL.—Standard Power Equipment Company has been incorporated with a capital stock of $2,000 to deal in, handle and install power equipments of various kinds. The incorporators are James M. Stamnard, George W. Clucas, Howard A. Baker.

CAMDEN, N. J.—The Imperial Gas & Electric Fixture Company has received a charter under the laws of New Jersey to sell and manufacture gas and electric appliances. The incorporators are Samuel W. Colin, Herman Schwarz and Webber Watkinson, all of Camden. The capital is $25,000. N.

## PROPOSALS.

ELECTRIC ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until September 25 for the installation of an electric passenger elevator in the post office at San Antonio, Tex., in accordance with plans and specifications, copies of which may be obtained from the Supervising Architect.

LIGHTING, HEATING AND POWER SYSTEM.—Sealed proposals will be received at the office of the Superintendent, U. S. Capitol Building and Grounds, Washington, D. C., until September 10 for a lighting, heating and power system for the court house. Intending bidders will receive plans and specifications upon application accompanied by check or cash in the amount of $10 as a guarantee for the return thereof.

ELECTRIC LIGHT SYSTEM.—Sealed bids will be received by the County Commissioners at their offices, at the Court House, Allentown, Penn., for the furnishing of all labor and material for the extension of the electric light system in the Hospital Building at the Lehigh County Home, near Wescoesville. Each bid must be made out on the form of proposal attached to the said specifications and to be accompanied by a certified check in the sum of ten per cent of the estimate, payable to the County Commissioners of Lehigh County, as a guarantee of good faith. Intending bidders can examine the plans and specifications at the office of the County Commissioners and secure copies of the same upon the deposit of $25 in cash. Bids should be addressed to H. C. Weinert, Clerk, and marked "Proposals for Extension of the Electric Light System in the Hospital Building at the Lehigh County Home."

ELECTRICAL WIRING AND MISCELLANEOUS SYSTEM.—Sealed proposals will be received from residents or taxpayers of the City of Springfield, Mass., by the Committee on City Property for the City of Springfield, Mass., until September 10, for an Electrical Wiring and Miscellaneous System, etc., in High School of Commerce at Springfield, Mass. Drawings and specifications may be seen at the office of Kirkham & Parlett, architects, Carr Building, Springfield, Mass. The proposal for said work shall be accompanied by a certified check drawn upon a state or national bank, for $1,000, payable to the order of the "Treasurer, City of Springfield, Mass." All proposals for the above work shall follow the specification form and be addressed to the Chairman of the Committee on City Property, and deposited at the office of the City Clerk, at the Municipal Building, Springfield, Mass., and shall have on the envelope, "Proposal for an Electrical Wiring and Miscellaneous System, etc., in High School of Commerce."

## DATES AHEAD.

National Electrical Supply Jobbers' Association. Fall meeting, Clifton Hotel, Niagara Falls, Canada, September 9-11.

Association of Edison Illuminating Companies. Annual convention, Cooperstown, N. Y., September 8-11.

American Electrochemical Society. Semi-annual meeting, Denver, Colo., September 9-11.

American Institute of Electrical Engineers. Pacific Coast convention, Vancouver, B. C., September 9-11.

International Brotherhood of Electrical Workers. International meeting, Boston, Mass., September 15.

Pennsylvania Section, National Electric Light Association. Annual convention. Delaware Water Gap, Pa., September 16-18.

National Association of Corporation Schools. First annual convention, Dayton, O., September 16-19.

New England Section, National Electric Light Association. Annual convention, Hotel Vermont, Burlington, Vt., September 17-19.

Illuminating Engineering Society. An-

nual convention, Pittsburgh, Pa., September 22-26.

Association of Iron and Steel Electrical Engineers. Annual meeting, New York, N. Y., September 22-27.

Indiana Electric Light Association. Annual convention, Indianapolis, Ind. September 24-25.

Colorado Electrical and Industrial Exposition, Auditorium, Denver, Colo., October 4-11.

Colorado Electric Light, Power and Railway Association. Eleventh annual convention, Denver, Colo., October 6.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Hutchinson, Kans., October 9-10.

Telephone Pioneers of America. Annual meeting, Chicago, Ill., October 13-17.

Jovian Order. Annual convention, Hotel Astor, New York, N. Y., October 14-16.

Railway Signal Association. Annual convention, Nashville, Tenn., October 14-17.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

American Mining Congress. First national mining show, Horticultural Hall, Philadelphia, Pa., October 17-25.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill. October 20-24.

Electric Vehicle Association of America. Annual convention, Hotel La Salle, Chicago, Ill., October 27-28.

# With the Electrical Manufacturers

**Terry Steam Turbine Company,** Hartford, Conn., has sold through the Stone & Webster Engineering Corporation, of Boston, a 50-kilowatt Terry turbogenerator set for the Pensacola Electric Light Company, Pensacola, Fla.

**Wagner Electric Manufacturing Company,** St. Louis, Mo., has opened a store and service department for the maintenance of its automobile starters at 1253 Woodwood Avenue, Detroit, and is combining with the same its Detroit office, which has heretofore been in the Ford Building.

**Thompson Levering Company,** Philadelphia, Pa., has issued bulletin G 1913 describing the Peerless portable testing sets, cable-testing apparatus and standard electrical instruments. A description is given of the various pieces of apparatus with illustrations and prices. Both high-sensibility and portable d'Arsonval galvanometers are included.

**Advance Electric Company,** St. Louis, Mo., has issued pocket catalog No. 11 describing Advance motors for single-phase and polyphase circuits. These are made in sizes from one-eighth to 7.5 horsepower. The bulletin gives a complete description of these machines and gives dimension diagrams and other data of interest and relation thereto.

**DeLaval Steam Turbine Company,** Trenton, N. J., has issued a booklet entitled "Improved Methods of Connecting Small Turbines in Steam Power Plants and Exhaust Heating and Drying Systems." This is a reprint of an article by G. H. Gibson, recently published in the *Journal* of the Engineers' Society of Pennsylvania. It is well illustrated and will prove of interest to those concerned with the use of small turbines in plants of the types referred to.

**Lighting Studios Company,** 16 East Thirty-third Street, New York, N. Y., has issued a pamphlet describing its sanitary dustproof lighting unit for hospitals, which is patented in the United States and Canada. An illustration of the new unit is given and its advantageous features explained. The fixture is supplied with a Doric moonstone hemisphere for the lower member, and with a clear-glass cover above. It is supplied in five sizes running from 10 to 20 inches in diameter.

**National X-Ray Reflector Company,** Chicago, Ill., has issued a special catalog dealing with its show-window reflectors. Five types of these have now been developed. They are described and illustrated, their dimensions and characteristics given, and typical store-window installations are shown in which they are employed. A valuable chart is given for determining the right type of reflector for any particular dimensions of window. In all cases an effectively and economically lighted window results from the proper use of these reflectors.

**The Arrow Electric Company,** Hartford, Conn., is located in a model new plant, which is getting to be one of the show-places of Hartford. The plant is equipped with the most up-to-date types of machinery, and electric power is used exclusively. The building is unusually well lighted and ventilated, and was carefully planned with the object of securing maximum efficiency in operation. The development of the company since its modest beginning a few years ago has been remarkable, even in the rapidly growing electrical industry. The company's new building is more than twice the size of the plant formerly occupied. The many additions to the Arrow E line of wiring devices are shown in a new catalog which will be distributed early in September and which is double the size of the previous one. The catalog not only shows a complete line of wiring devices, but contains much useful information relative to electric wiring and various wiring devices.

**The Jefferson Glass Company,** Follansbee, W. Va., has prepared a portfolio descriptive of fine art illuminating glassware. This portfolio is designed primarily to portray to the more prominent architects of the country the beautiful effects that are available in illuminating glassware as produced by the Jefferson Glass Company. Typographically, the portfolio is one of the most beautiful specimens of printing that has been turned out in many a day. The art of printing has advanced to such a stage that the most beautiful effects can be produced, but despite the high degree to which the work has been carried, in this instance it really does not duplicate the beautiful effects that have been produced by this company. The portfolio shows designs in Moonstone glass of an old ivory finish in the form of Greek urns, Roman leaf designs, Virginian etched combinations of old ivory and Wedgewood blue, a roughed-surface oak leaf design in Moonstone, a pearl green Virginian etched ceiling bowl in Moonstone, an artistic lantern of Art Nouveau characteristics in roughed Moonstone, and other glassware of similar character. This glassware is made to the architect's designs for all kinds of fixtures for direct, indirect and semi-direct illumination.

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has recently received orders from the Dayton Power & Light Company for a 100-kilowatt synchronous rotary converter and three 365-kilowatt transformers; from the Boston Elevated Railway Company for two 2,000-kilowatt six-phase converters and six 375-kilowatt air-blast transformers; from the Marquette City & Presque Isle Railway Company for a 200-kilowatt rotary converter and two 110-kilowatt transformers and switchboard; from the Interborough Rapid Transit Company for two 300-kilowatt direct-current generators driven by steam turbines through reduction gears; from the Los Angeles Gas & Electric Corporation for a 300-kilowatt motor-generator set; and from the Merchants Power Company for a 300-kilowatt motor-generator set; for Centralia Gas & Electric Company, one 200-kilowatt, 600-volt, 3-phase, 60-cycle rotary converter with three 75-kilowatt, 2,200-volt, high-tension transformers; for City of Cleveland, two 300-kilowatt, 250-volt, 3-phase, 60-cycle rotary converters with two 330-kilowatt, 2,300-volt transformers and a switchboard; for Maryland Electric Railway Company, Annapolis, Md., four 300-kilowatt, 1,200-volt, direct-connected 3-phase, 25-cycle self-starting rotary converters and four 300-kilowatt, 13,200-volt, 3-phase transformers and two switchboards; for Hartford Electric Light Company, one 200-kilowatt, synchronous motor-generator; for Sears, Roebuck & Company, Chicago, Ill., one 1,500-kilowatt, 228-volt, compound-wound commutating-pole turbine-reduction-gear-driven generator.

# Record of Electrical Patents.

## Issued by the United States Patent Office, August 26, 1913.

**1,071,036. Method or Process of Producing Hollow Tapes, Ribbons or Bands of Metal.** F. A. Feldkamp, Newark, N. J., assignor to Electrolytic Products Co. Consists in passing a band of readily fusible metal into an electrolytic tank, passing wire as an anode upon the opposite sides of the band and depositing a shell of metal upon the fusible metal core.

**1,071,037. Apparatus for Electroplating Hollow Tapes, Ribbons, or Bands.** F. A. Feldkamp, assignor to Electrolytic Products Co. Consists of means for continuously drawing a band of cathode metal and anode wire into the tank, through the electrolyte and out of the tank.

**1,071,044. Process of Making Bearing Compositions.** E. G. Gilson, assignor to General Electric Co. Collecting brushes are made by subjecting a mixture of copper oxide, tin oxide and graphite to a temperature of about 700 degrees centigrade until all but a small percentage of the oxides have been reduced.

**1,071,046. Signaling System.** J. L. Hall, assignor to General Electric Co. Comprises a series of electric indicators, a continuously operative step-by-step mechanism, and ratchet mechanism operated at predetermined intervals thereby.

**1,071,060. Vapor Electric Apparatus.** O. O. Kruh, assignor to General Electric Co. Includes means for starting the rectifier through the aid of a storage battery and for then connecting the battery so as to be charged from the rectifier.

**1,071,070. Power Installation for the Propulsion of Marine Vessels and for Other Purposes.** H. A. Mavor, Glasgow, Scotland. Electric ship-propulsion system comprising a turbogenerator, a propelling motor, a motor-driven exciter and interlocking control equipment.

**1,071,081. Means for Preparing Asbestos Fiber for Insulating Purposes.** H. L. Owen, assignor to General Electric Co. Comprises a carding machine to deliver carded flocculent asbestos in separated strips, a conveyor for receiving the strips and a number of tapes for receiving the strips from the conveyor.

**1,071,087. Electric Switch.** G. B. Reisbach, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. A solenoid operates the switch and toggle links lock the switch in closed position.

**1,071,109. Respirator.** C. Stiriz, New York, N. Y. Has an electric spark gap in the air duct.

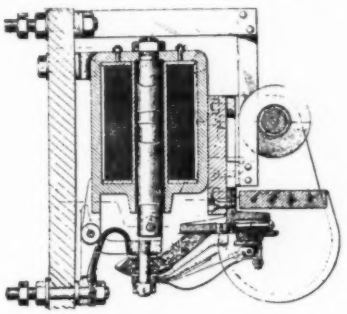
**1,071,138. Current-Controlling Device.** L. Bradley, Milwaukee, Wis. A rheostat with several columns of compressible carbon resistances, and a pressure-appliance means consisting of a lever, cam and roller.

**1,071,142. Automatic Vibrating Circuit-breaker.** E. B. Craft, assignor to Western Electric Co. Electromagnetically operated for a telephone ringer.

**1,071,169. Safety-Appliance Lock for Automobiles and the Like.** J. H. Mertz and E. Schatz, Washington, D. C., said Mertz assignor to said Schatz. A switch in which a key must be inserted between terminals to close the circuit.

**1,071,171. Supervisory System.** J. G. Nolen, assignor to Fire Protection Development Co., New York, N. Y. A signaling system for detecting breaks in the alarm circuit.

**1,071,174. Process of Working Refractory Metals.** M. von Pirani, and H. Pohl, assignors to General Electric Co. A method of working tungsten incorporated with nickel consists in drawing the composition through a succession of dies, the material being heated

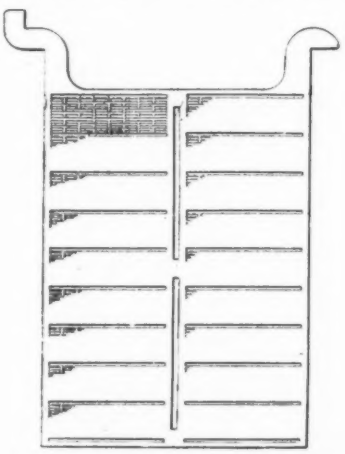


1,071,200.—Switch.

as it enters each die sufficiently to expel a portion of the nickel.

**1,071,196. Influence Electric Machine.** H. Wommelsdorf, Schöneberg, Germany. A rotatable peripherally grooved insulating disk, has carriers imbedded therein and extending to the apex of the groove and stationary conductors fitting in the groove and adapted to carry away the charges at the outer edges of the carriers.

**1,071,200. Electric Switch.** T. E. Barnum, assignor to Cutler-Hammer



1,071,322.—Expansible Battery Plate.

Mfg. Co., Milwaukee, Wis. Covers details of construction of an electromagnetically operated switch with laminated contacts. (See cut.)

**1,071,204. Electric Sadiron.** J. Cayéré, Oakland, Cal. The cover is of heat-insulating material arranged to reflect the heat downward.

**1,071,207. Telephone System.** E. R. Corwin and C. A. Bals, assignors to Corwin Telephone Mfg. Co., Chicago, Ill. A relay system automatically connecting a periodic ringing current to the called line.

**1,071,208. Telephone System.** E. R. Corwin, assignor to Corwin Telephone Mfg. Co. The operator's set is automatically cut out by relays after the called line responds.

**1,071,209. Telephone-Exchange System.** E. R. Corwin, assignor to Corwin Telephone Mfg. Co. Relates to interconnection of the line, supervisory and clearing-out signals.

**1,071,210 to 1,071,212. Telephony.** E. R. Corwin, assignor to Corwin Telephone Mfg. Co. These three patents relate to methods of testing and safeguarding exchange and intercommunicating systems.

**1,071,247. Elevating Machinery.** C. E. Leyda, Pittsburgh, Pa., assignor of one-half to L. Llewellyn. Automatic means for starting, stopping and reversing the driving motor when a certain weight of material is placed in the bucket.

**1,071,267. Telegraphic Transmitter.** W. E. Shaw, Sheridan, Wyo. The sending relief includes a vibratory member and relief spring contact carried thereby.

**1,071,279. Protective Device for Electrical Circuits.** H. R. Van Deventer, Sumter, S. C. A lightning arrester formed from flat material bent into zigzag shape.

**1,071,292. Lockout Telephone for Party Lines.** E. Bowman, Elmwood, Ont., Can., assignor of one-half to C. R. Miller. Relates to the lockout electromagnet.

**1,071,313. Electric Warp Stop-Motion.** J. Hancy, Jamestown, N. Y. A contact strip is slidably mounted in holes in the guide strip.

**1,071,322. Storage Battery Plate.** M. Koener, Chicago, Ill. The plate has several horizontal and vertical clearance areas to permit ready expansion of the active material. (See cut.)

**1,071,325. Manuracture of Filaments of Tungsten or Molybdenum for Electric Incandescent Lamps.** A. Lederer, Vienna, Austria-Hungary. A paste for squirting the raw filaments is composed of tungsten dioxide and an agglutinant consisting of an ammonia solution of casein.

**1,071,336. Means for Use in Controlling Induction Motors.** N. Pensabene, Birmingham, England. Relates to the construction of a centrifugal switch for short-circuiting the rotor.

**1,071,337. Burglar Guard and Alarm.** E. S. Phelps, Elizabeth, N. J. An electric alarm associated with a window grating.

**1,071,350. Electrical Heating Unit.** H. H. Russell, assignor to W. D. Hodson, Janesville, Wis. The heating element for a fireless cooker comprises a pair of flat disks with a resistance coil interposed between them.

**1,071,354. Electrical Separator.** F. O. Schnelle, Frankfort-on-the-Main, Germany. Has means for feeding to an inclined conductor a mass of particles of different susceptibilities to electrostatic repulsion.

**1,071,359. Secondary Battery.** A. M. Sherer, assignor to C. T. Fox, Wayne, Pa. A grid with main ribs defining

polygonal spaces and a number of concentric ribs in each space.

**1,071,373. Ignition System and Apparatus.** R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Ignition controller with a number of contacts and a magnet adapted to maintain them, associated.

**1,071,393. Buoy for Submarine Boats.** D. L. Cayo, Wooster, O. Carries an antenna mast and is connected to the submarine by a special electric cable.

**1,071,419. Insulator.** B. Hetherington, Everest, Kans. A cubical block with longitudinal wire-receiving slot and transverse external groove for an inverted J-shaped hook fastening the insulator to the cross-arm.

**1,071,442. Preparation of Granular Carbon.** J. C. Lee, Brookline, Mass. Consists of an upper and a lower chamber connected by a narrow throat, there being an electrode in each chamber to send a current through the material as it passes through the throat.

**1,071,476. Ozonizer.** E. C. Spurge, Niagara Falls, N. Y.; L. T. Spurge, G. E. Cox and G. Slate, Jr., administrators of said E. C. Spurge, deceased. Comprises a two-part casing constituting one electrode and a unitary structure consisting of two dielectrics and an electrode between them.

**1,071,488. Process and Apparatus for Sintering Refractory Materials.** G. Weintraub and H. Rush, assignors to General Electric Co. Particles of boron are sintered into a solid mass by continuously applying pressure upon the particles while conducting a current through them until the material softens and sinters.

**1,071,490. Bending and Welding Machine.** W. C. Winfield and A. C. Taylor, Warren, Ohio, assignors to Winfield Mfg. Co., Warren, O. Electric welding machine with special clamping devices.

**1,071,506. Railway Crossing Signal System.** G. Bryant, Highland Park, Ill. An electric system with separate trolley-wire sections adjoining a highway crossing.

**1,071,522. Electric Reversing Gear.** C. Krämer, assignor to Felten & Guilleaume-Lahmeyerwerke Aktien-Gesellschaft, Frankfort-on-the-Main, Germany. Includes a special motor-generator regulating set and a controller.

**1,071,532. Smoke and Fume Recorder.** W. W. Strong, Mechanicsburg, Pa. Includes an electric field for depositing particles suspended in the smoke. (See cut.)

**1,071,545. Reeling and Feeding Mechanism.** R. W. Armstrong, assignor to Gray National Telautograph Co., New York, N. Y. Electromagnetically controlled actuating mechanism for a reel.

**1,071,546. Multipolar Dynamo-Electric Machine.** B. A. Behrend, assignor to Allis-Chalmers Co. and Bullock Electric Mfg. Co. The positive brush groups are connected together at one end and the negative brush groups at the other.

**1,071,566. Electric Switch, Circuit-Breaker, and the Like.** D. K. Morris and G. A. Lister, assignors to Morris & Lister, Ltd., Coventry, England. Comprises a pair of tension elements, a switch-retaining lever and toggle pieces interposed between the elements and lever.

**1,071,568. Manufacture of Incandescent Bodies of Tungsten.** A. Pacz, assignor to General Electric Co. A plastic material for the formation of raw filaments comprises the product obtained by bringing together a soluble compound of tungsten, gallic acid and a precipitant.

**1,071,588. System of Selective Control.** C. E. Scribner, J. L. McQuarrie and E. B. Craft, assignors to Western Electric Co. Comprises a selector at each station responsive to positive or to negative impulses.

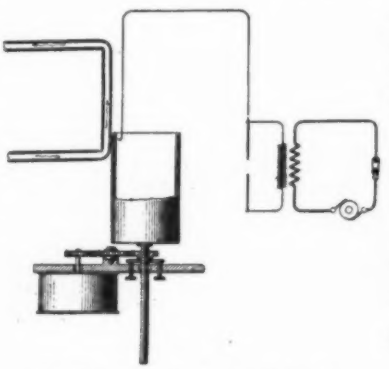
**1,071,590. Radial Drill.** W. T. Sears, assignor to Pratt & Whitney Co., Hartford, Conn. Motor-driven.

**1,071,601. Substation Telephone Set.** W. O. Beck, assignor to Western Electric Co., New York, N. Y. A wall set with special shelf support.

**1,071,602. Ignition System for Rotary Oscillating-Cylinder Engines.** H. Braunton, San Francisco, Cal. One electrode projects from each piston and the other is grounded on the piston.

**1,071,608. Protective Device for Printing Presses or the Like.** W. Y. Dear and E. S. Cole, assignors to Jersey City Printing Co., Jersey City, N. J. An electric stop motion actuated when a break occurs in the web paper passing through the press.

**1,071,617. Electrical Coupling.** J. L. Hinds and J. J. Dossert, assignors to Crouse-Hinds Co., Syracuse, N. Y. A solderless T-branch connector with sleeve passing round the cable and a transverse clamping member.



1,071,532.—Electric Smoke Recorder.

**1,071,633. Combination-Lock and Circuit-Breaker.** G. J. Buckeye, Kansas City, Mo., assignor of one-fourth each to H. L. Mason, S. Baker and S. R. Hill, Kansas City, Mo., and one-fourth to W. D. Nowlin, Glen Rose, Tex. For automobile ignition or similar circuits.

**1,071,641. Switch-Throwing Mechanism.** H. C. Kinsel, Altoona, Pa. A car-operated switch governs the solenoid-actuated track switch.

**1,071,644. Railway Car.** J. S. Lindall, Boston, Mass. Has a special weatherproof monitor window for permitting manipulation of the trolley rope and pole.

**1,071,649. Electric Glow Lamp.** W. Nernst, assignor to Nernst Lamp Co., Pittsburgh, Pa. The Nernst glower, consisting of an intimate mixture of magnesia and a small percentage of tungsten acid.

**1,071,652. Signaling System for Party Lines.** R. F. Spamer, assignor to Western Eelctric Co. Relay-controlled selective signaling for way stations in railroad telephone dispatching.

**1,071,657. Electrically Controlled Lock.** H. G. Voight, New Britain, Conn. Electromagnetically controlled blocking means to prevent movement of the bolt.

**1,071,669. Railway Signal System.** J. Leitgeb, Great Falls, Mont. Electric system with a sectional conductor and a continuous conductor, a circuit-closer on each train engaging the conductors.

**1,071,675. Arc Lamp.** C. E. Crane, Seattle, Wash. Means for trimming the carbons consist of a body provided on opposite faces with cutting teeth and means for moving it between the carbons.

**1,071,676. Method of Insulating Electrical Conductors.** J. A. Heany, Washington, D. C. Consists in covering a thread with a coating of fibers, applying the thread to the surface of the wire and reducing the fiber-coated thread to a layer of uniform thickness.

### Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 1, 1913.

566,760. Electric Switch. J. L. Hornig, St. Louis, Mo.

566,762. Village or House Telephone System. E. G. Hovey, Chicago, Ill.

566,784. Selective System. A. L. Merrick and B. Brooks, Springfield, Mass.

566,786. Electric Railway System. J. M. Murphy and A. F. Pierce, Danbury, Conn.

566,795. Electric Heater. F. L. Pruyn, Albany, N. Y.

566,801. Electric Railway System. W. Robinson, Boston, Mass.

566,829. Toll-Board Apparatus For Telephone Exchanges. V. Wietlisbach, Bern, Switzerland.

566,860. Electrical Construction, Regulation and Distribution. T. H. Hicks, Detroit, Mich.

566,874. Electric-Distribution Machine. W. R. Sinclair, Milwaukee, Wis.

566,887. Detector for Railway Switches. W. H. Berrigan, Jr., Brooklyn, N. Y.

566,889. Electric Motor. J. Bram, Decatur, Ill.

566,892. Regulating Socket For Electric Lamps. A. Chute, Chicago, Ill.

566,896. Electrical Selecting Instrument. A. Dupler, Jersey City, N. J.

566,914 and 566,915. Electric Selector. A. Le Blanc, New York, N. Y.

566,916. Selecting Device. A. Le Blanc.

566,917. Electrical Transmitting Instrument. A. Le Blanc.

566,918. Electromagnet. A. Le Blanc.

566,936. Automatic Starter For Electric Motors. J. E. Putnam, Rochester, N. Y.

566,939. Electric Car-Brake. A. B. Roney, Chicago, Ill.

566,984. Electric Railway. R. M. Hunter, Philadelphia, Pa.

566,985. Telegraphy. J. M. Joy, New York, N. Y.

567,022. Electric-Light Hanger. J. F. Diehl, J. F. Diehl, Jr., and D. Diehl, Pittsburgh, Pa.

567,112. Electrical Communication. J. A. Sullivan, Cincinnati, O.

567,116. Electric-Lamp Pole. M. B. Bailey, Brooklyn, N. Y.

567,118. Trolley. F. W. Canales, Portland, Me.

567,119. Electric Motor. R. Eickemeyer, Yonkers, N. Y.

# Electric Vehicle Section

## A Model Electric Garage.

**The Fashion Automobile Station, Chicago, described in this article, will be, when completed, one of the two largest garages in the world devoted exclusively to electric pleasure vehicles, it being possible to charge 120 cars at one time. The garage equipment installed includes the most modern apparatus designed for this service.**

One of the wonders in the industrial world of recent years has been the almost phenomenal development of the gasoline automobile business, and this activity has no doubt had a marked effect on electric-vehicle development. There has naturally been a lack of proper adjustment between the rapidly increasing number of electrics in service and adequate garaging and charging facilities, and it has only been within the last year or two that the development in garage practice has approximated the advances made in electric vehicles.

Formerly, gasoline garage managers, appreciating, in a measure, the profitable business accruing from charging and caring for electrics, installed a rectifier or two and promptly announced their establishments as charging stations, or electric-vehicle garages. In a few isolated cases a shed or building was remodeled and equipped as an exclusive electric garage; but these installations are a long step from the present model garages as exemplified by the Fashion Automobile Station, Chicago.

This garage, which represents the latest ideas in construction and which embodies all equipment at present available for the proper caring for and charging of electric vehicles is located at Fifty-first Street and Cottage Grove Avenue, in the heart of an exclusive South Side residential district. At the

Interior of Fashion Automobile Station, Chicago. View Shows One of the Aisles.

present writing charging equipment is installed to charge 80 cars at one time, but by October 1 the increased equipment being installed will permit of 120 cars being charged at one time.

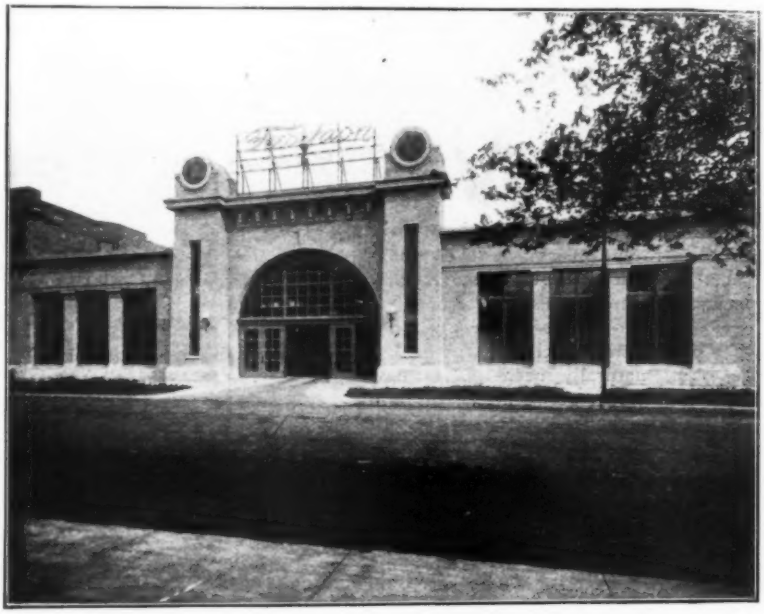
The building is of ornamental brick and reinforced concrete, with a steel roof, making it absolutely fireproof. It is one story high and comprises two wings, forming an L. The section running north and south, facing Fifty-first Street, measures 130 feet by 180 feet, while the section fronting Cottage Grove Avenue, running east and west measures 50 feet by 180 feet. The office is located at the junction point of the two sections and also being L-shaped permits of an unobstructed view of the entire building.

Temporarily, gasoline cars are being housed in the Cottage Grove Avenue wing but these will be displaced by electrics as soon as the necessary equipment is installed. This will make a total of 34,800 square feet of floor area available for handling cars and will make the Fashion garage one of the two largest in the world devoted exclusively to electric vehicles.

The Fifty-first Street wing, having an area of 23,400 square feet, is divided into three bays by bumpers in which the charging circuits are imbedded. A view of the central bay is shown in one of the accompanying illustrations.

A model switchboard of nine panels is located in the center of the room, accessible from any location. There are eight charging panels, each equipped with new type carbon-compression rheostats made by the Allen-Bradley Company of Milwaukee. The resistance in these rheostats is secured through the imperfect contact between the surfaces of prepared graphite disks, piled in a column. This contact resistance varies with pressure, and the resistance changes are caused by subjecting the column to various degrees of pressure. The columns of disks are inclosed within an insulated steel tube, which is provided with suitable terminals and plungers for transmitting the pressure to the disks. As the resistance of these rheostats is not varied by cutting in and out resistance units, by means of a contact arm and segments, but is dependent upon the pressure applied, the current may be set exactly at any desired value, regardless of the number of cells being charged, and may be raised gradually.

The center panel of the switchboard is equipped with main line switches and a watt-hour meter for measuring the energy used. A Printometer is also installed for furnishing a printed record of the energy used at specified time intervals, this record being used by the Commonwealth Edison Company in ascertaining the time of maximum demand. A special direct-current line from the Edison Company's Hyde Park substation was built by the garage, this insuring a high grade of service and eliminating the danger of inattention or inexperience in operating motor-generator sets at the garage.



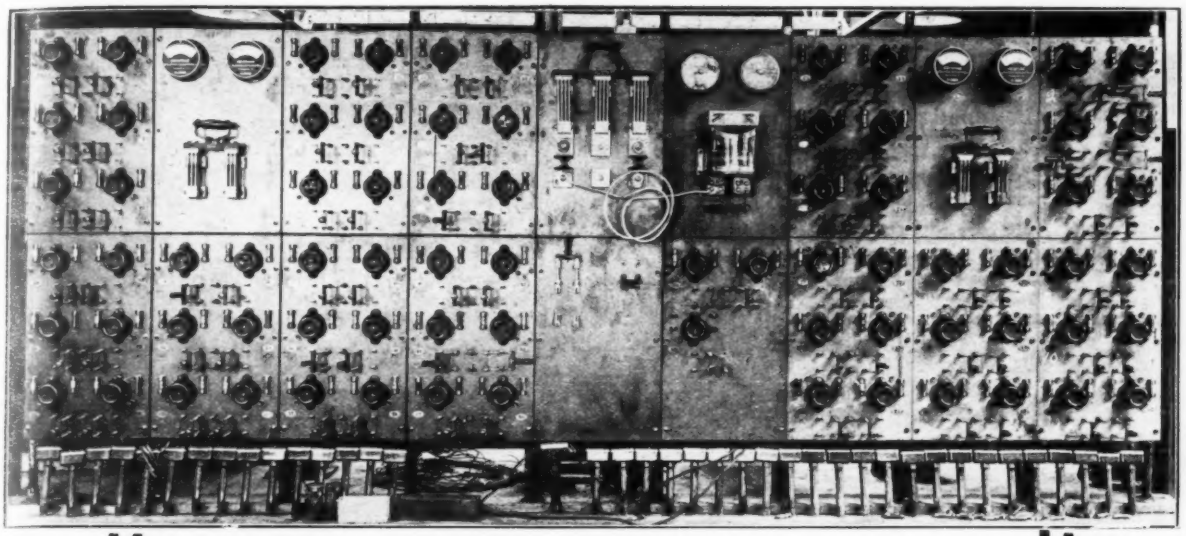
Fifty-first Street Entrance of Fashion Garage.

All charging circuits are run in conduit under the cement floor. The wiring for light and power is also run in conduit between the walls. Universal charging plugs of the Anderson swivel type are used exclusively.

In the northeast corner of the Fifty-first Street section there is located a fully equipped machine shop and trim shop where repairs of any extent can be made. In fact, it is possible to completely rebuild a car with the equipment installed. The machines, comprising two lathes, two drills, shaper, emery wheel, etc., are driven by a five-horsepower motor which also drives an air compressor supplying air to tires. In the trim shop all work is done by hand.

Section of Machine Shop, Fashion Garage.

The extreme north end of the garage is equipped as a battery room, where



# Chicago's Largest Electric Garage Is Equipped With

## Allen-Bradley

# Battery-Charging Rheostats

This switchboard, recently completed for the Fashion Garage, Chicago, shows 80 Allen-Bradley Compression Battery-Charging Rheostats. 40 additional rheostats will be installed, giving a capacity for charging 120 electric vehicles at the same time. This installation will equal that of the world's biggest electric garage, the Murphy Power Company of Detroit, in which Allen-Bradley Rheostats to the number of 120 are in service.

These and other large users chose Allen-Bradley Rheostats for battery-charging duty on account of their freedom from brushes, sliding contacts, segments, coils and grids. The current can be set exactly at any desired value, regardless of the number of cells to be charged,—from one up to the maximum number permitted by the voltage of the supply circuit.

***Write for Bulletin 40. It contains information valuable to users of storage batteries.***

## Allen-Bradley Co.

495 Clinton Street Milwaukee, Wis.

CHICAGO OFFICE, 72 WEST ADAMS STREET

batteries can be built, tested, repaired and cleaned. Distilled water furnished by an automatic distilling equipment is used exclusively in flushing batteries.

The space south of the battery room is utilized as a wash room, two automatic washers being installed overhead. When cars are being washed a downward pressure is exerted on the hose suspended from the washers. By releasing hose the water supply is cut off. A portable electric vacuum cleaner, mounted on a truck, is used for cleaning car interiors.

The lighting of the Fashion garage is worthy of particular mention as it closely follows the most exacting specifications for illumination of this class of interior. A total of 150 100-watt tungsten-filament lamps equipped with white-enameled steel reflectors are suspended from the ceiling, spaced uniformly so as to give well distributed light over all parts of the building. No localized lighting is needed in any part of the main charging room. Natural lighting has also been given a maximum of attention, numerous skylights being cut in the roof.

A word as to organization and management at the Fashion garage. As service is the commodity sold, no detail is overlooked in giving the utmost care and attention to cars. One man is employed who devotes his entire time to inspecting and testing batteries and regardless of tests all batteries are flushed 2 to 3 times each month. Another employee devotes his entire time to alining wheels and making minor adjustments. In addition there is, of course, a day crew and night crew in charging room, machine shop, battery room, wash room, etc. As each car leaves the garage it is given a thorough inspection by an inspector stationed at the exit.

## Fixture Dealers' Association Formed.

The Retail Lighting Fixture Dealers' Association, of Pittsburgh, Pa., has been formed to help the men in the chandelier trade. Temporary officers have been named. The members of the Association are the Welden & Kelly Company, the Joseph Horne Company, Pittsburgh Gas & Electric Fixture Company, Incandescent Supply Company, Bleustone Incandescent Company, Dun & Company, Highland Mantel & Tile Company, Cullen & Brody, Stinson & Kennedy and the Ludwig-Hommel Company.

The new Municipal Building in New York City will include an artificial-ice plant, for which $32,000 has been appropriated. It will supply ice to the various city departments only.

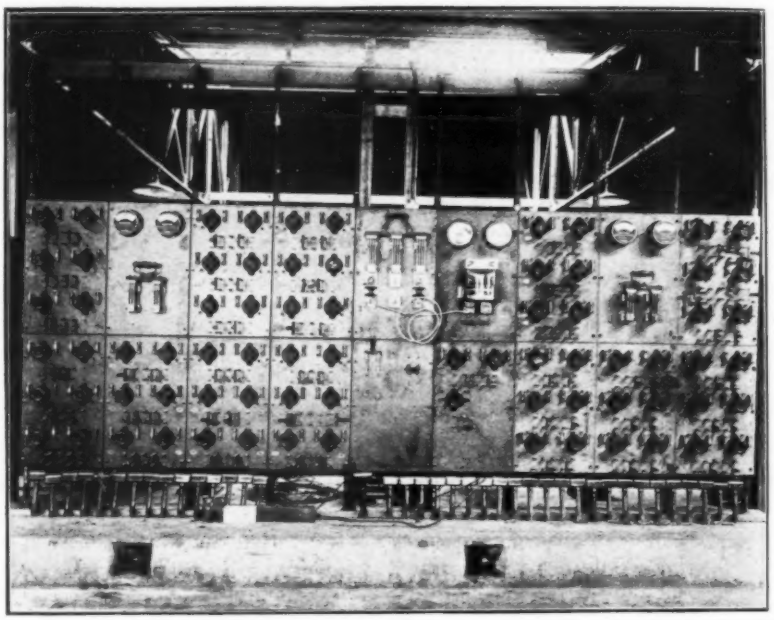
## Some Interesting Baker Electrics.

The accompanying illustrations show several very interesting equipments recently furnished by the Baker Motor Vehicle Company, of Cleveland, O.

Fig. 1 shows a three-and-one-half-ton truck recently purchased by the Goodyear Tire & Rubber Company, Akron, O., to be used in a dual capacity: first, as an electrical testing machine to measure the efficiency of all Goodyear electric truck tires by actual run; second, general trucking between the Goodyear plant and depots, and over the course chosen for tire testing.

The truck is equipped with a complete set of extra wheels so that tires may be adjusted on one set of wheels while the truck is running. In this way little time is lost in changing tires for the test run.

This truck was delivered from the Baker factory in Cleveland to the Goodyear factory in Akron, a distance of 42 miles on its own power. After reaching there a number of Goodyear officials were taken for a ride about Akron. An ascent was made up North Hill, which is one of the steepest and longest grades in the State of Ohio,



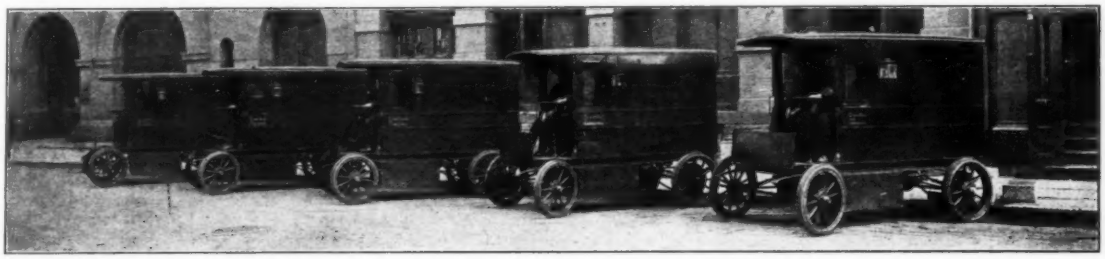
Main Switchboard, Fashion Garage.

Fig. 1.—Tire Testing Electric Truck.

# The Merchant, the Central Station and the Electric Truck

Other things being equal, the merchant offers the public what the public demands or what he thinks will please the public. The degree of service offered is regulated in part by competition. In other words the first merchant who installs electric wagons for parcel delivery, practically forces his competitors to do likewise.

Now you know the merchants in your city and they know you. They look to you for advice in the purchases and installation of things electrical. They accept your advice as coming from an authority. Furthermore he would rather do business with you than with an organization in another city.



When you buy gasoline trucks for Central Station work you are not only rowing upstream—you are indirectly working against the best interests of the merchant who looks to you for a certain amount of his business success. On the contrary when you put in Electric Trucks, you can say to the merchant "We know that G. V. Electrics, for example, are dependable. They are efficient in our work, and they will be in yours. We would like to have your order for one or more of these trucks with the latest G. V. refinements."

Is yours a 100 truck city? It surely is if you are disposed to meet the merchant and the manufacturer in your locality half way. G. V. Electrics are now so well-known both as to name and to performance that every Central Station finds it easier to interest the local buyer in the wonderful G. V. Product.

***Write for catalogue 85 and other information.***

## General Vehicle Company, Inc.

**General Office and Factory: Long Island City, N. Y.**

**New York Chicago Boston Philadelphia**

and a trip of several miles was made around town. At the conclusion of the run there were still several miles left in the batteries of the truck.

Fig. 2 shows four two-ton Baker electric trucks in the service of the New York Edison Company. For the purpose of making quick battery changes so that their trucks can be kept in service continuously, the New York Edison Company has equipped its electric truck garages with pneumatic lifts, and the battery cradles on all of their electric trucks are especially designed to take batteries from these lifts as they are brought straight up from the floor level into the battery cradle. Instead of putting the batteries in through the side of the cradle in a number of trays, they are lifted up through the bottom and fastened in automatically. The automatic catch and release in the trucks shown is so designed that it is entirely inside the battery housing unexposed to mud and water.

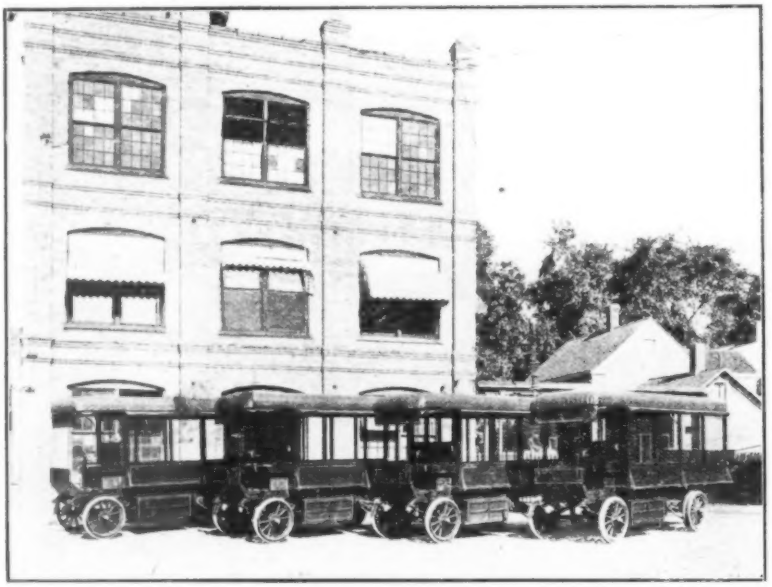


Fig. 2.—Baker Electrics for New York Edison Company.

Fig. 3 shows a three-and-one-half-ton truck in the service of the Porto Rico Ice Company. On account of the torrid heat in Porto Rico and the long haul of six miles over which ice must be carried from the ice station to the substation, it was necessary to have the truck body as nearly heatproof as possible; so the following special construction was followed out. The side, front and roof are of double panel construction, 4 inches thick and all packed between the panels with cork. To withstand the intense heat from the ground, the floor is made four and one-half inches thick and is built in layers. From top to bottom, these layers are one inch solid oak plank; one and three-quarters inch of asphalt composition; one inch of cork board; three-quarters inch Georgia pine boards. The rear doors of the truck are regular refrigerator doors.

There are trap-water outlets in the bottom of the truck, which can be seen in the photograph. These outlets are so designed as to let water out and not admit air, as a little water is always standing in the bottom of the trap. When the rear doors are closed this truck is a veritable refrigerator, practically air tight and will carry ice in hot Porto Rico weather for many miles.

Inside the body are adjustable cross bars which can be put in against the ice to hold it from shifting while in transit, whether the truck is loaded fully or not. The rear step, which is shown let down, is a folding step and when folded up will not permit any one riding "free of charge." There is a ticket box back of the driver's seat, where the drivers drop the tickets for ice.

Fig. 3.—An Electric Ice Truck for Porto Rico.

## Long Trip in Detroit Electric.

It was recently clearly demonstrated by two electric automobile enthusiasts at Washington, D. C., that the Detroit electric is a perfectly safe car in which to make a moderate tour. The round trip between Washington and Baltimore is 82 miles, and at the time of this run part of the road had just been heavily oiled by the State Road Commission. This materially checked the machine. At one point, heavy sand was encountered, but the electric had no difficulty in pulling through it. The car left Washington at 7:40 a. m. and four hours later was in the down-town district of Baltimore. The run through Baltimore was over cobblestones. The drive back to Washington occupied an hour longer as it was necessary, because of road repairs, to return by Hyattsville and the Queen Chapel Road.

The Detroit electric arrived in Washington in excellent condition and had sufficient current remaining in the batteries to travel a number of miles further. It is interesting to know that this car had already been driven a distance of 6,213 miles with the same equipment.

# Books on Electric Vehicles

## The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 320 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.

The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 320 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

This is a brand new book from cover to cover—1911 Edition—and must not be confounded with any former editions of this popular work.

**TEXTBOOK ON MOTOR CAR ENGINEERING.** By A. G. CLARK

To be complete in two volumes. Vol. I., Construction. 213 illustrations. 6x8¾. Cloth. 457 pp. Price $3.00.

Contents: General Principles and Construction of the Petrol Engine; Details of Engine Construction; Petrol and Other Fuels; Carbureters and Carburation; Thermodynamics of the Petrol Engine; Horse Power; Mechanical, Thermal and Combustion Efficiencies; Principles and Construction of Coil and Accumulator Ignition; Magneto Ignition; Engine Control and Cooling Systems; Crank Effort Diagrams; Clutches and Brakes; Gears, Lubricants, Lubrication Ball and Roller Bearings; Chassis Construction; General Principles of the Steam Car; Steam Engines and Condensers; Steam Generators and Pipe Diagrams; The Electric Car; Materials Used in Motor Car Construction; Examination Papers; Physical Properties of Petrol; Mathematical Tables and Constants.

**PRACTICAL AUTOMOBILE DICTIONARY.** By S. KRAUSZ

English-French-German; French-English-German; German-French-English. With an introduction by C. J. Glidden. Twelve thousand technical terms and other words employed in connection with motor cars and motoring. For use in office, factory, repair shop and touring in foreign countries. 16mo. Leather. 129 pp. Price $2.00.

**SELF-PROPELLED VEHICLES.** By JAMES E. HOMANS

A practical treatise on the theory, construction, operation, care, and management of all forms of automobiles. Seventh Edition, revised. 500 illustrations. 6x9. Cloth. 667 pp. Price $2.00.

The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

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### Edison on Electrics.

As a factor in the world's transportation, both in the pleasure and commercial field, says *The Electric Vehicle*, published by the Denver Gas & Electric Light Company, the electric has gained a decided advantage and must be considered a most formidable competitor of all other kinds of transportation. Its superiority over horse equipment has long been demonstrated, but it now appears that its economy will result in placing it in the front ranks in the horseless-vehicle class. Merchants are beginning to realize that the electric is not only a capable vehicle for transportation, but one to be given the fullest consideration and attention, as it has proved to the satisfaction of thousands of merchants that it is reliable in every respect.

Of the 30,000 cars now in use in this country, 10,000 were manufactured last year and the widespread interest in this type of car should greatly stimulate the efforts of everyone connected with the industry. Between July 1, 1911, and July 1, 1912, it is estimated that the increase in electrics in New York City amounted to 45 per cent, and in Chicago there has been an increase of 400 per cent in the use of electric vehicles during the past two years.

Thomas A. Edison early in the history of the electric commercial vehicle, predicted that the advent of the electric would gradually drive out the horse. He claimed that municipalities would put the ban on horses for sanitary reasons.

With the passing of time the prediction of Mr. Edison is coming true and every year there is a noticeable reduction in the number of horses used for commercial transportation, especially in the larger cities like New York and London. There are now over 2,000 machines of the electric type in use in New York City, and London has also shown a material increase. Paris and Berlin use the electric extensively. In fact, electric cars are quite numerous on the streets of foreign cities.

In a recent expression on the future of the electric, Mr. Edison stated that in some respects it was making far better progress than the gasoline machine. "The reason," he says, "for the increasing popularity of the electric and falling off in popularity of machines of other kinds of power, is due to the cost of the power for running each type. Electric current is constantly being reduced in price, while gasoline is constantly soaring."

While Mr. Edison does not insist that the electric can compete with the gasoline vehicle over long routes and service requiring high speed, he does believe that for city and suburban service the electric has the call and it will not be many years before the electric commercial vehicle will entirely supplant gasoline machines for this particular kind of service.

Here is another important statement by Mr. Edison: "I was shown the balance sheet of a big New York department store covering the comparative cost of operation for three commercial gasoline machines and twenty electrics doing the same work. The cost of operating the three gasoline cars was $1,400, and the cost of 20 electrics was $1,800 during the same period of time. That didn't take in the repairs either."

It is already a widely known fact that electrics are used largely for pleasure purposes, but, according to Mr. Edison, that does not indicate that the electric will not assume just as important a position in the commercial trucking field. He believes that the greatest future of the electric is in the commercial transportation field. He ascribes, as the reason, the remarkable jump forward of the electric in recent years and the reliability of the cars, coupled with the low operating cost. Looking at the situation broadly, it is out of the question to attempt to solve all the problems of commercial transportation with the gasoline motor car. He thinks the whole problem resolves itself into a comparison of the gasoline motor, with hundreds of reciprocating parts moving at high velocity, and the electric motor, with one moving part which revolves.

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